PMI

PHOTO METHODS FOR INDUSTRY

VOL. 4 NO. 1
JANUARY
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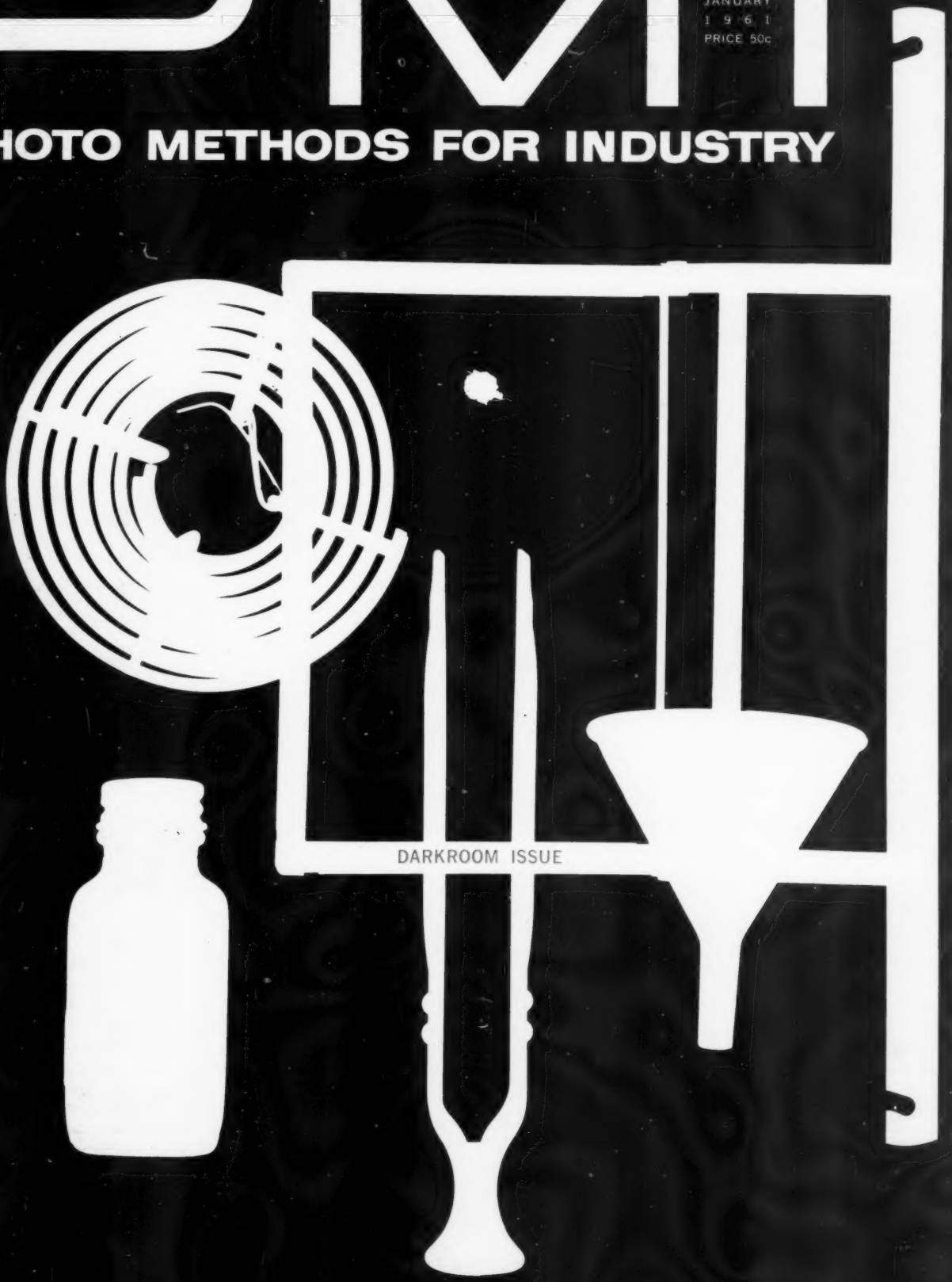
PRICE 50c



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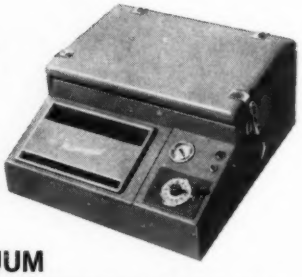

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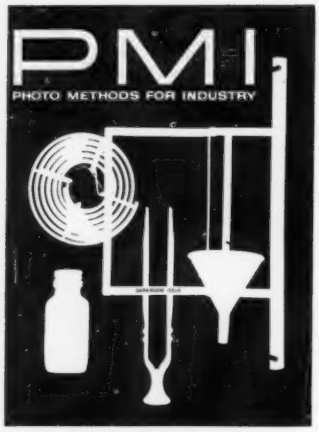

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77 NEW PRODUCTS What's new for the industrial photographer

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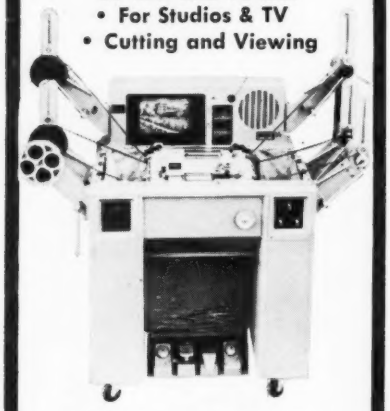

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F.Y.I.

We have a great number of items for FYI which have one thing in common: they arrived at PMI's office too late to do any good. If you are planning a meeting or any affair, let us know about it *six* repeat *six* weeks in advance so we can print it in time to do everyone some good. We go to press one month before issue date. Right now, we should be receiving last-minute notices for February events and on-time notices for March. Give us plenty of time so that if we are stuck for space one month, we can print your item the following month and still be of service. This also applies to our fellow department, COMING UP.

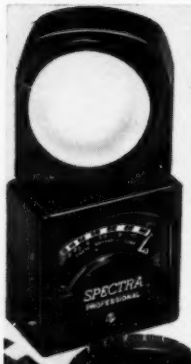
We would like to repeat once more that the columns of FYI are open to you for news and personal items.

Odds, ends and in-between

Our favorite poet Sam Anon once commented, in a much more poetic way, of course, that after every home-cooked meal comes the heartburn. Well, our picnic, PMI Directory, has been over long enough for the inevitable errors to turn up. We have long ceased to cry over them unless they become numerous and heinous. With every press run, we cross our fingers and hope, in vain, that everything will be perfect. Anyway, from time to time, we will print necessary amendments, corrections, etc., to go with the PMI Directory.

On page 143, "Projector, Still, Fully Automatic," the Spindler & Sauppe *SelectroScope* should be *Selectroslide*. All other details remain the same. Our apologies to S & S.

A last minute item which seems interesting if you are concerned with the subject is SMPTE's new book, *Instrumentation and High-Speed Photography*, Volume I, Series II. A compilation of papers which have appeared in the SMPTE *Journal*, the large (8 x 11, 187 pp.) book runs the well-known gamut from "Cameras and Lights for Underwater Use" by Edgerton and Haodley to "A Simple Schlieren System for Two Simultaneous Views of a Gas Flow" by Rudinger and Somers. It would seem that this book is a worthwhile addition to either a working or a reference library. Incidentally, is there really a difference between the two? Let's just say it belongs in any photographic library.



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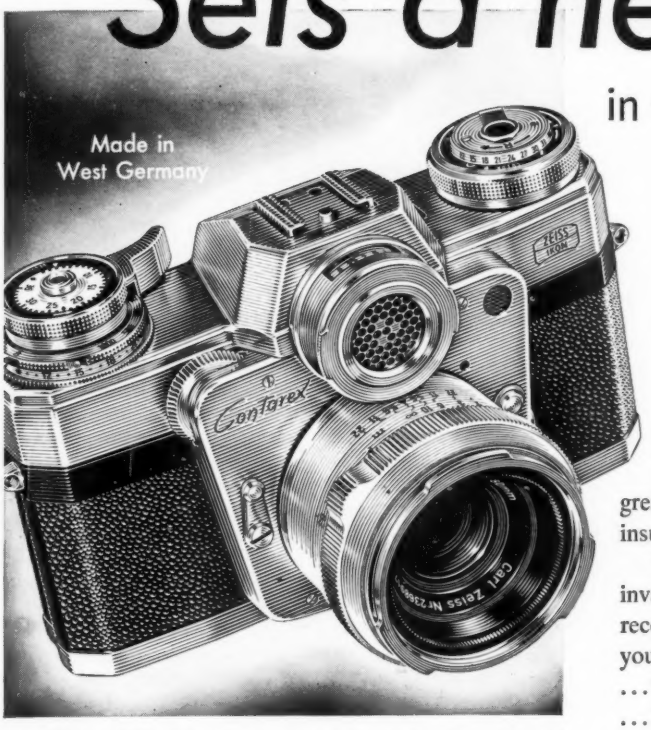

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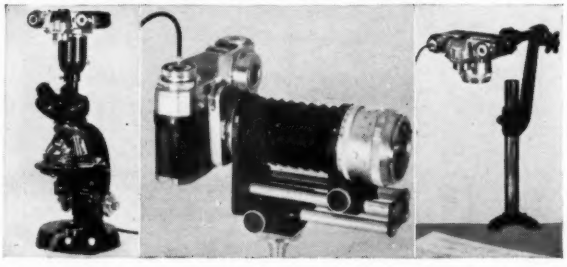

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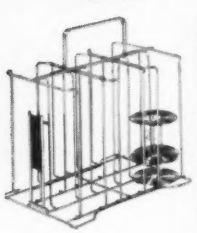

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COMING UP

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JANUARY 16-20, 23-27, 30-FEBRUARY 3 Tecnifax Corp. Visucom Workshops of visual communication. Holyoke, Mass. For complete information regarding these free programs write to: Fred J. Pula, Tecnifax Corp., 195 Appleton St., Holyoke, Mass.

FEBRUARY 16 Eastern Regional Photo Instrumentation Round Table & Clinic. Hotel Statler-Hilton, N. Y. Arthur Dorman, Walnut 1-2345, Syosset, L. I.

MARCH 12-16 MPDFA Convention, Convention Hall, Philadelphia, Pa.

MARCH 19-25 American Society of Photogrammetry, Annual Meeting, Hotel Shoreham, Washington, D. C.

MARCH 23-26, 1961 Westprint 61, Graphic Arts Exposition. Shrine Exposition Hall, Los Angeles, Calif.

APRIL 4-6 National Microfilm Association Convention, Hotel Sherman, Chicago, Ill.

MONTHLY MEETINGS

Association of Federal Photographers Meetings every third Wednesday at 8 p.m. G.S.A. Building, 7th and D Sts., S.W., Washington, D. C.

Binghamton Chapter SPSE Meetings every third Tuesday. Contact H. G. Morse, Ansco, Binghamton, N. Y. RA 2-4221, Ext. 573.

Boston Chapter SPSE Contact John Taylor, Itek Corp., 700 Commonwealth Ave., Boston, Mass., CO 7-5210.

Cleveland Chapter SPSE Meetings the first Tuesday of each month. Cleveland Engineering & Scientific Center, 3100 Chester Ave., Cleveland, Ohio. Contact Robert E. Birr, General Electric, Nela Park, Cleveland, Ohio. GL 1-6600.

Manhattan Chapter Society of Reproduction Engineers Meetings every third Monday. Contact J. Ryerson, Joseph Dixon Crucible Co., Newark 2, N.J. DE 3-3000.

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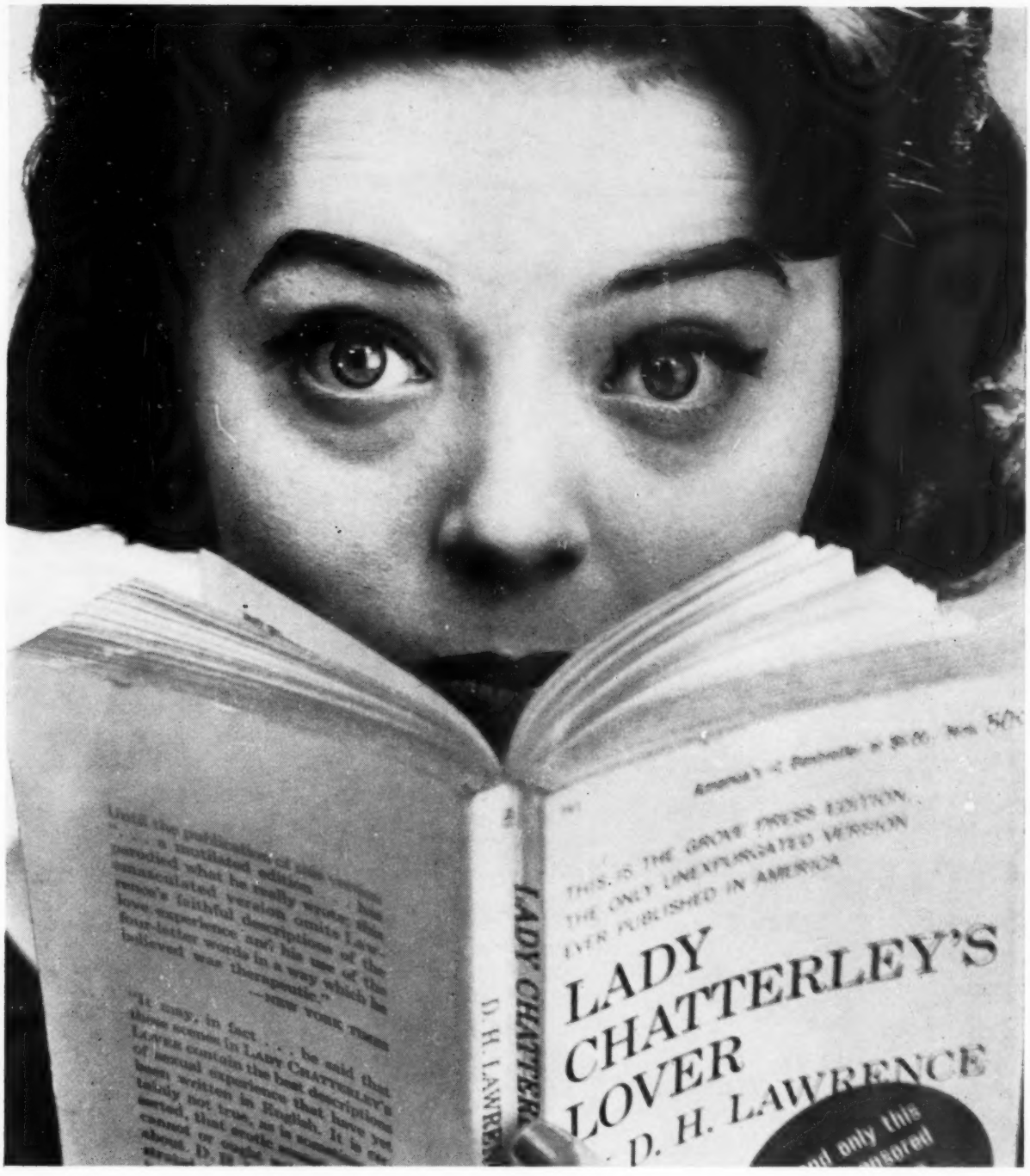

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COMING UP

(*continued from page 8*)

Industrial Photographers of America Essex House, Newark, N. J. Meetings every second and fourth Thursday. Contact Tom Holbarton, 181 Lake Drive West, Packanack Lake, Wayne, N. J. or R. Handley, The Port of New York Authority, 111 8th Ave., New York 11.

Midwest Industrial Photographers' Association Contact John E. Schrage, c/o Deere & Co., Photo Department, 3300 River Drive, Moline, Ill.

National Visual Presentation Association, Inc. New York City. Meetings every second Thursday. Contact M. E. Schack, 19 W. 44th Street, N. Y., N. Y. MU 2-2294.

New York Chapter SPIE Meetings every third Thursday. Contact Don Bass, P.O. Box 177, Bethpage, L. I., N. Y. Liggett 4-8196.

New York City Chapter SMPTE Meetings first or second Wednesday of each month. Contact Ed Warnecke, Eastman Kodak Co., 342 Madison Ave., New York, N. Y. MU 7-7080.

Rochester Chapter SPSE First Monday. Contact Woodlief Thomas, Jr. Color Technology Division, Building 65, Kodak Park, Rochester 4, N. Y. CO 6-2500.

Chicago Chapter Biological Photographic Asso. Meetings every third Tuesday. Contact Dorothy Pinkham, 551 W. Grant Pl., Chicago, Ill. DI 8-6400.

Rocky Mountain Industrial Photographers Meetings every fourth Monday. Contact P. H. Broadie, 2170 S. Lincoln, Denver 10, Colo. Telephone PEarl 3-2200.

Southern California Chapter SPSE Meetings the last Monday of each Month. Contact Ben Augustine, 235 Annandale Rd., Pasadena 2, Calif. Telephone MU 1-0076.

Southern California Chapter Industrial Photograhers Meetings every third Tuesday. Contact Janet Marshall, Executive Secretary, 5463 Virginia Ave., Los Angeles 29, Calif. HO 5-6614.

If you wish to have your meeting dates listed in this column send in the necessary information to COMING UP, PMI, 33 W. 60th St., New York 23, N. Y.

PMI Goes to Bed Early

So mail early to get your news in FYI and Coming Up. Right now you should be sending items for March and April, 1961.

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Lloyd E. Varden

PHOTO METHODS FOR TOMORROW

Colossal, tremendous, stupendous, astonishing photo sensitivity!!!

Exactly one week from this time of writing, a special—and I must say, unique—conference will begin in London, England; it has the bizarre title, "The Ultimate Sensitivity in Photography—To-day and To-morrow." This conference, sponsored by the Royal Photographic Society of Great Britain (Scientific and Technical Group), begins on December 7 and continues through December 9. Photoscientists from England, Scotland, Germany, Holland, Belgium, Russia and the United States will be participating.

Apparently the main purpose of the conference is to attempt to prove that photographic sensitivity has a definite limit and to try to predict what this limit is.

Subjects to be presented

Surprisingly, less than one-quarter of the papers abstracted in the advance program that I received recently have a specific relationship to ultimate sensitivity. From the list of subject titles which follows I think you will agree.

1 Investigations of Aqueous Extracts of Photographic Gelatins by Paper Electrophoresis. **2** Investigations of Interaction between Gelatin and Noble Metals. **3** The Effect of Gelatin on the Covering Power of Developed Silver. **4** Methods of Controlling the Speed of Photographic Emulsions. **5** Reaction Kinetics of a Photochemical Process. **6** Latensification of Negative Emulsions. **7** The Use of High Speed Ektachrome Under Severely Limited Lighting Conditions. **8** Information Theory in Practical Photographic Systems. **9** The Graininess and Granularity of Complex Graininess Patterns. **10** Equivalent Quantum Efficiency and the Information Content of Photographic Images. **11** Single-stage Image Intensifiers. **12** Multi-stage Image Intensifiers. **13** Low Brightness Photography with Electro-optical Intensifiers. **14** Quantum Sensitivity Measurements on Photographic Emulsion Grains. **15** How Many Quanta? **16** On Necessary Measurements for the Characterisation and Optimum Use of Photographic Materials for Scientific Purposes. **17** The Theoretical Limits of Photographic Sensitivity. **18** Limits and Possibilities of the Photographic Process. **19** Predictions of Ultimate Sensitivity.

What ultimate sensitivity?

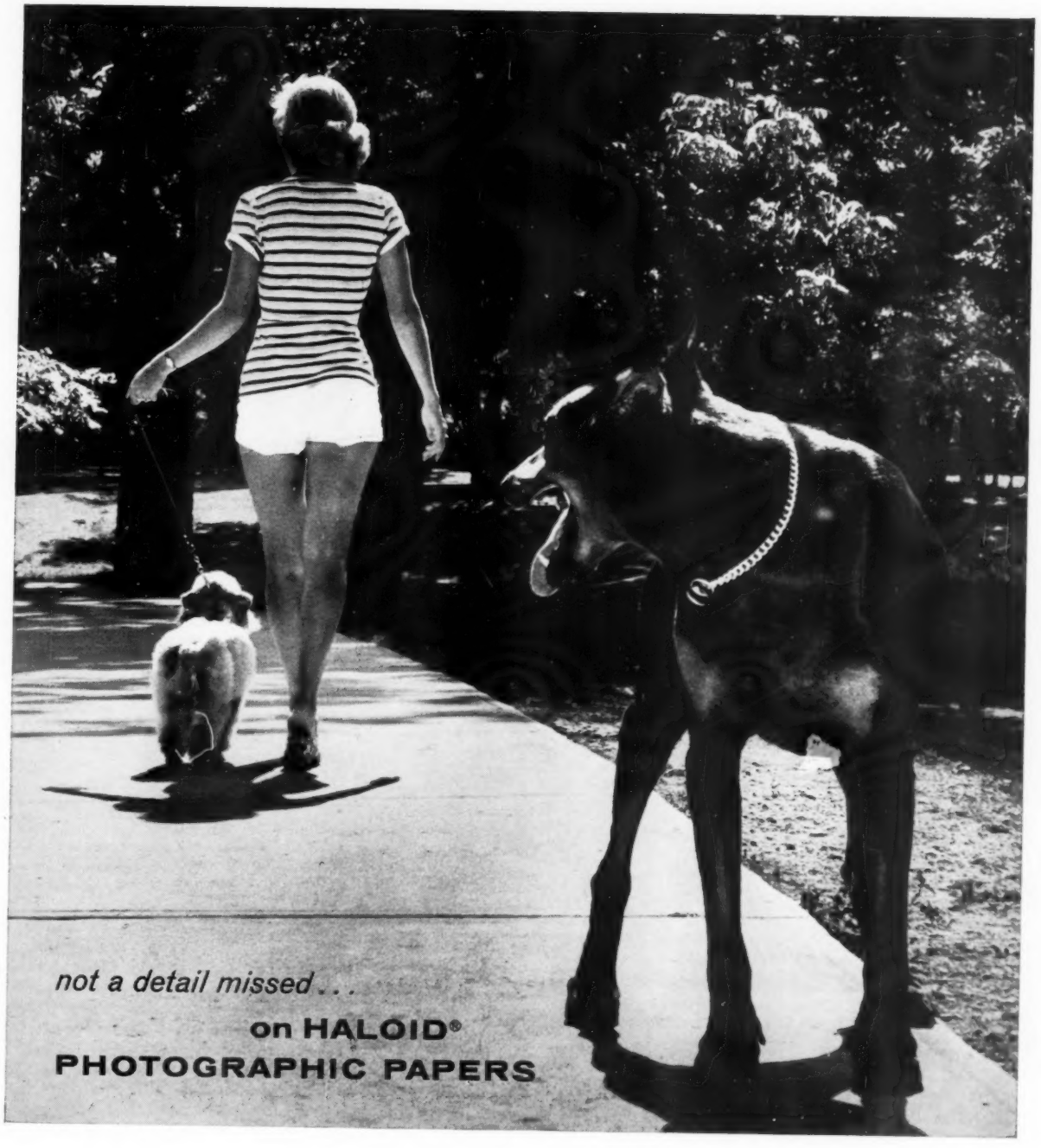
The expression "ultimate sensitivity" with reference to photographic recording should, in my opinion, be spelled out in rigorous form by some member of this conference so that everyone will be thinking of the same concept when the expression is used. Even the title of this particular conference is confusing. How can one speak of the ultimate sensitivity in photography *today*. This is a misuse of the word "ultimate," and rather implies that "highest attainable practical film speed" was really intended, which is quite a different thing from ultimate sensitivity, unless I am more confused than I thought.

The reason I am emphasizing the need for a definition of ultimate sensitivity, even if it has to be completely revised later on, is due simply to the fact that so many different approaches have been taken by research people in this field it is next to impossible to compare the conclusions of one study against another.

Visibility unlimited?

There are a few who are willing to state that no limit to photographic sensitivity exists. Yet in a strict sense it can be argued, via a semantic approach, that a limit does not necessarily have to exist. Don't forget that the time-honored meaning of *photography*—"writing with light"—still holds. And *light* can be defined as

(*continued on page* 14)



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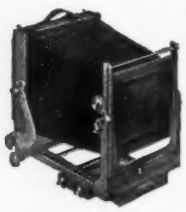

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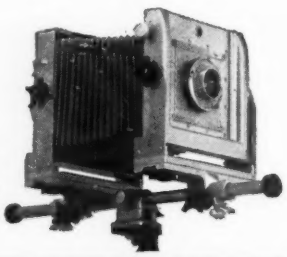

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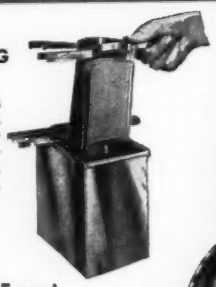

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METHODS FOR TOMORROW

(*continued from page* 12)

those electromagnetic radiations in quantities capable of producing a visual sensation. Therefore, a photographic process that is sufficiently sensitive to record a developable latent image of information under conditions that are below the luminance and time thresholds of the human eye would be one that exceeds the sensitivity limits imposed by the definition of photography. Since such a process is conceivable, it is invalid—on the basis of this approach—to refer to the ultimate sensitivity in photography, because the defined limit of sensitivity is dependent upon the sensitivity of the visual system and not upon the photographic process.

Quality quanta

This sort of approach to the subject may appear ridiculous, but it probably will be no more perplexing to students than many others. Sometimes photo-scientists refer to the number of small light units, called quanta, necessary to make a silver halide crystal developable. A single silver halide crystal though, cannot form a useful record. Thus, we must consider the amount of light energy necessary to expose millions of gelatin-dispersed silver halide crystals simultaneously. A comparison of these two approaches leads to the conclusion in one case that four or five light quanta absorbed by a single high-speed emulsion crystal are adequate for its development. This makes it appear as though the photographic process overall is extremely efficient. In the second case we may find that thousands of quanta per unit area are needed to expose a film to the point where a useful negative can result. These two conclusions are entirely compatible when everything is taken into consideration, but unless one has made a fairly thorough study of the subject it is likely that he will consider photo-scientists a wacky lot—THE END

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Arnold Eagle

INDUSTRIAL MOTION PICTURES

A camera may take a movie, but it's cutting that makes a film

In my November column, I discussed types of films in which each cut illustrates a separate point made by the narration but is not connected visually with any other cut. Continuity and story depend completely on the sound track and the narration for clarity. I call this type of film the newsreel type, since this is how newsreels are made.

Newsreel-type films which depend entirely on narration to develop continuity have many shortcomings. They do not hold the attention of the viewer nor do they have the emotional effectiveness of a well-constructed film using space-time visual continuity or that uses cinematographic montage techniques.

The most influential element in a motion picture is the creation of the illusion of reality on the screen. A successful, well-constructed film has the ability to make the viewer participate in the illusion presented on the screen. Two-dimensional images become real. To retain this illusion, a cinematic visual logic must be used in addition to story and dramatic content. There must be clear and lucid continuity and the transitions between cuts must be smooth. The film maker must not confuse the viewer or disturb him visually.

The viewer does not notice the techniques of visual continuity and editing unless something is illogical or there is a mistake or a jump. Bad technique breaks the illusion of screen reality. This is a symbolic realism, substituting a set of new visual experiences for real life. Events that may take hours, days or even years are condensed into a few moments of screen time.

Continuity cuts

There are two major types of continuity cut: the match cut and the cutaway. In the match cut, the second shot continues the act the exact instant that the first shot stopped. The third cut continues where the second one ends, etc. In the cutaway shot, the camera shows a different object that is in the same physical location but that was not seen in the previous cut. The cut following the cutaway can come back to the original subject which has, in the meantime, shifted in time and space.

Here is a typical cutaway:

Scene 1 CU Housewife sitting in an armchair reading a magazine.
Scene 2 MS She looks up, gets up from chair and walks out of frame.
Scene 3 CU Cutaway shot of pot on stove boiling over.
Scene 4 LS Housewife reaches stove and turns gas off under pot.

They never miss it

What we did in the above sequence was to point out the reason for the housewife's rush without having to show her walking from chair to stove. This walk might have taken four or five seconds. The shot of the pot took only one second. The audience's attention was diverted from the walk and the viewers were not aware of the three or four seconds missing from the action.

Cuts must match in several points. First, appearance and background must match. If the housewife above were wearing an apron in the first shot, she must wear it in succeeding shots (unless you show her taking it off). If she is reading a magazine in the first shot, she must not hold a newspaper in the second shot. Background must be identical unless the camera angle is changed.

Movement must match. The movement in the second cut must be continued from the first shot. If the housewife starts to turn a page in the first shot, she must continue in the second. If we show her walking to the stove, she must continue from the same spot in a second shot, unless we show her walking out of the frame. Then we can pick her up walking into the frame on the second shot, at the store.

Direction must match. If a person walks out of the frame at the left

(*continued on page* 18)

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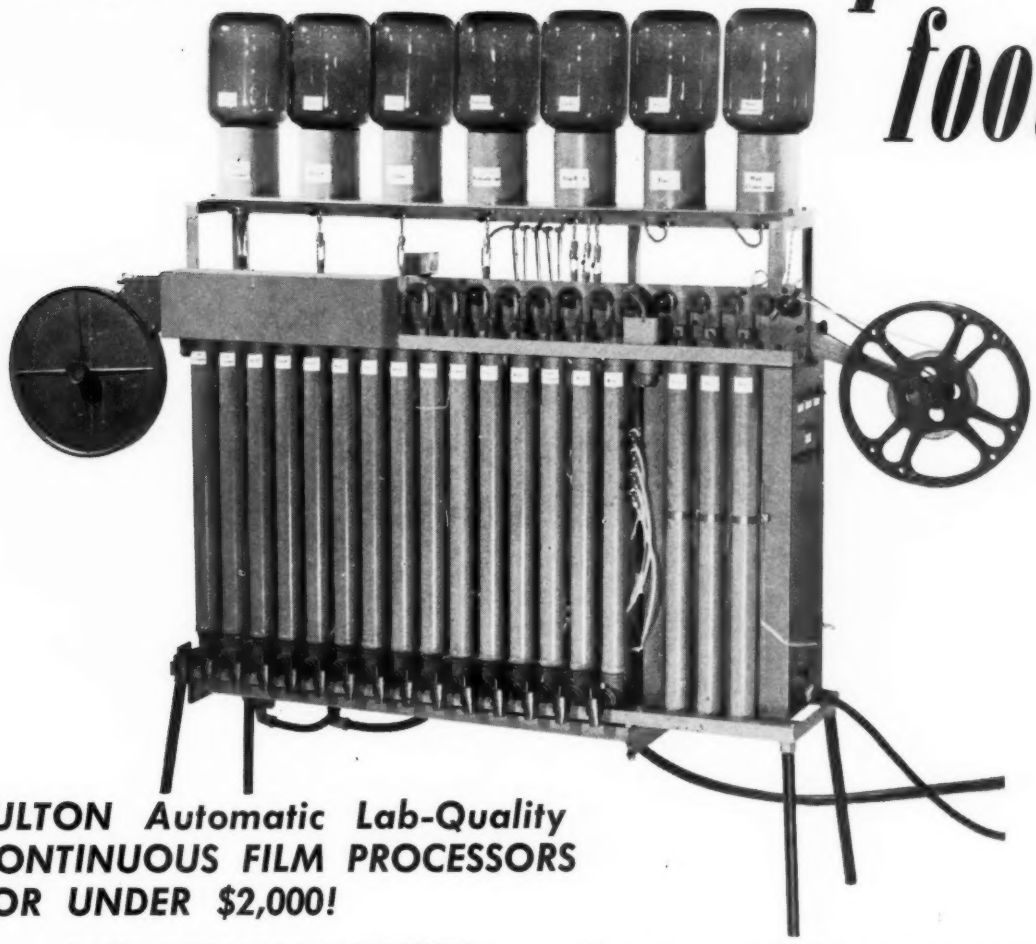

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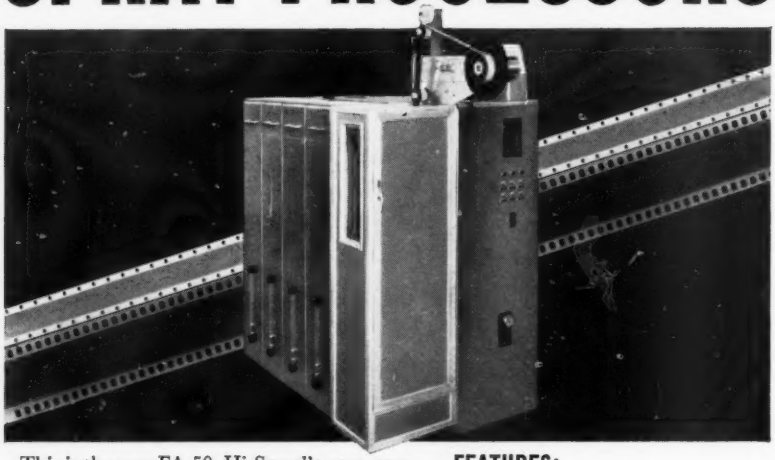

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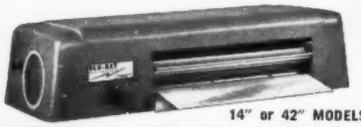

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IND. MOTION PICTURES

(*continued from page 16*)

side of the screen and then, in the next cut, comes in on the left, it seems that he has changed his mind and is returning. To keep the same direction, a person leaving from the left must enter from the right, unless there is a substantial intercut to distract the viewer so that he does not become aware of the change.

Relative position must match. If you have two people talking in a medium shot, reversing the camera angle 180 degrees will reverse the position of the people. The audience will be confused as the one on the left side is now on the right side and vice versa, for no reason.

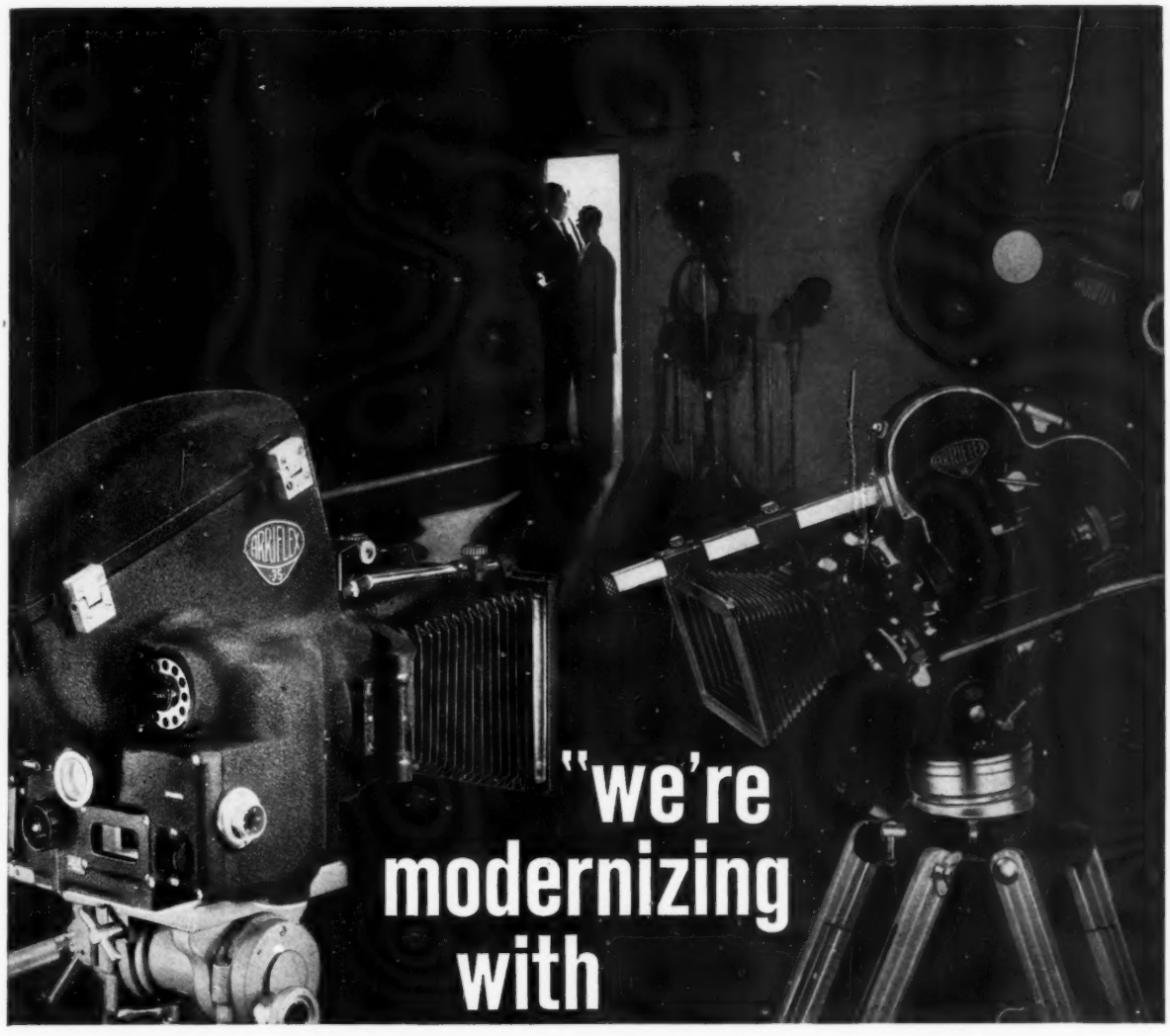
If you show a person in profile looking right in a medium shot, you may not show him looking left in the next close-up. Even more important, if you show a man looking to the left, the action or subject which attracted his attention must appear on the left. This is one mistake that drives film editors wild. It happens because in many cases, the director remembers to shoot some cutaways only after all scenes are finished. By that time, nobody remembers the direction of the look.

The same type of lighting must be maintained throughout all shots of the same subject. You cannot start shooting a continuity sequence with the sun out in one shot and an overcast sky in the next shot. If the key light in shot one comes from the left, in shot two it must come from the very same direction.

Matched lenses

Exposure level must match, especially in color work. This is why a matched set of lenses is so important in movie photography. If the lenses are not matched, have the light-transmission calibrated so that your 25mm lens at f/4 will transmit the same light as the 50mm lens at f/4. To avoid discrepancies in exposure, many movie lenses are calibrated in T-stops which indicate transmission, rather than f/stops which are a mathematical relationship of aperture to focal length.

Another name for the cutaway shot is insert. A cutback is a cutaway showing an insert from a previous scene. Cross cutting or parallel cutting is cutting back and forth between two sequences taking place simultaneously. The chase scenes in cowboy films are perhaps the most famous examples of cross cutting. First we see the hero, then the outlaws pursuing him, then the hero, then the outlaws, etc.—THE END



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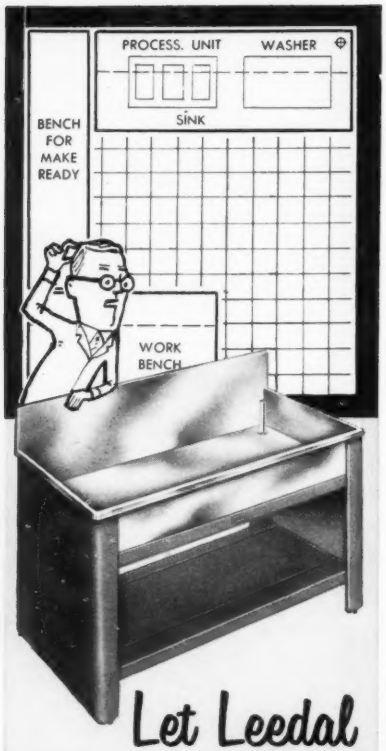

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David B. Eisendrath, Jr.

WORKING PHOTOGRAPHER

Some comments on camera care: a syringe and brush in time saves

A few weeks ago I dropped in to Professional Camera Repair Service to see Marty Forscher, the proprietor, and the new shop that the company had recently moved into at 37 West 47th St., New York, N. Y. Marty probably does repair and service work for more big name photographers than anyone in the country. Magazine photographers, illustrators, press photographers and industrial men not only beat a path to his door, but ship air express packages to him from all the proverbial corners of the globe.

Marty was deep inside a Rollei when I appeared at the front desk, but extended me the courtesy of allowing me to come through the gate into the well-equipped repair shop. I said I wanted to leave a pair of Leicas and some lenses for him to check. "What's wrong with them?" Marty asked. I assured him that there was no major complaint, I just felt it was time to have them cleaned and checked. I knew this would please Forscher; not that he needed or wanted the business—his assistants are kept as busy as he is—but Marty is a firm believer in "preventive medicine."

Overhaul period

If more people would realize that a regular overhauling and adjustment of a good camera would lengthen its life many times over, Marty says, cameras would last longer, give less trouble, and give top performance. What's a "regular" overhaul period? Like an automobile it depends much on how hard and far it's been driven, but any piece of equipment used several times a week or more should be checked and serviced at least once a year, not when it begins to give trouble.

Of course, good technicians and anyone with respect for fine equipment should do minor servicing themselves as often as use demands.

Marty tells me that the cheapest investment a photographer can make in protecting his investment in equipment is a little time every week and very little special equipment. Basic camera care kit is a good 15¢ paint brush to loosen up dust and dirt and a rubber ear syringe to blow dust out. Good lens tissues and lens cleaner should also be included. A good vacuum cleaner or air hose is also helpful, but he warned against using an air hose in the darkroom where it may just blow dust or chemicals around. Also, when using a vacuum cleaner, be sure the exhaust end isn't placed so it blows dirt around the floor.

Weekly checkout

A regular weekly checking out of a miniature camera should include blowing (or sucking) dust, dirt and film chips out of the camera body, and a good examination with a work light or flashlight into the chambers to see if dirt is sticking in corners. I use stuff called Plasti-Tak put out by Charlie Brooks of Brooks Manufacturing Co., Cincinnati 24, Ohio. This is a tacky plastic material, like a stiff putty, that never dries out. A small ball of it on the end of a pencil or orangewood stick can be pushed into corners and the dirt sticks to it. If a clean piece is pressed onto a lens (or transparency!) without rubbing, it will remove fingerprints, unless they're on for such a long time they've affected the lens coating itself.

Forscher recommends the use of cotton swabs such as "Q-tips" for cleaning rangefinder and viewing windows; Marty's first lieutenant, Buddy, added a note that the Johnson & Johnson variety were not on wooden sticks and wouldn't scratch.

On cameras using roll films, it's smart to put a *very* small touch of oil at the film roller pivots, but Marty hates to tell people to do this because they often use too much oil and it may spread, run, mess up the camera and get on the film. (This is why he warns against do-

(*continued on page* 22)

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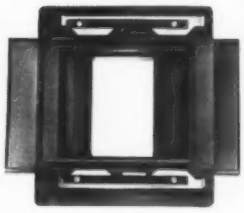

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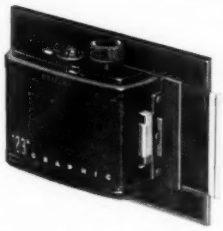

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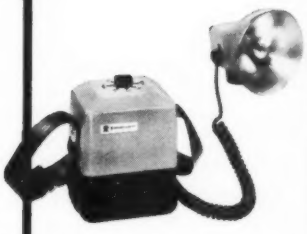

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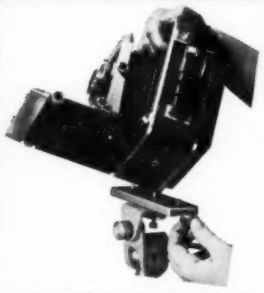

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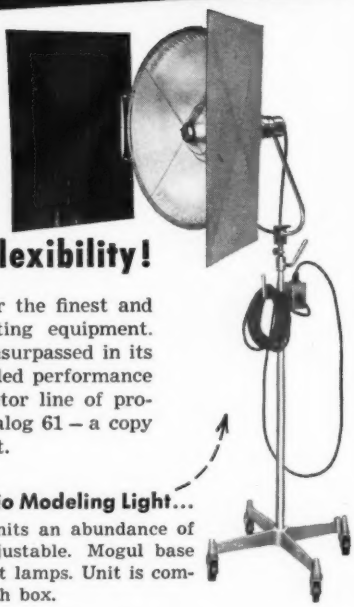

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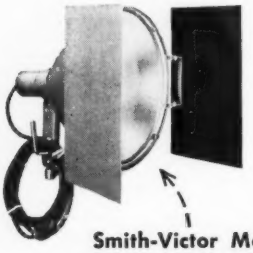

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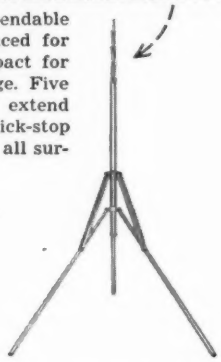

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(*continued from page 20*)

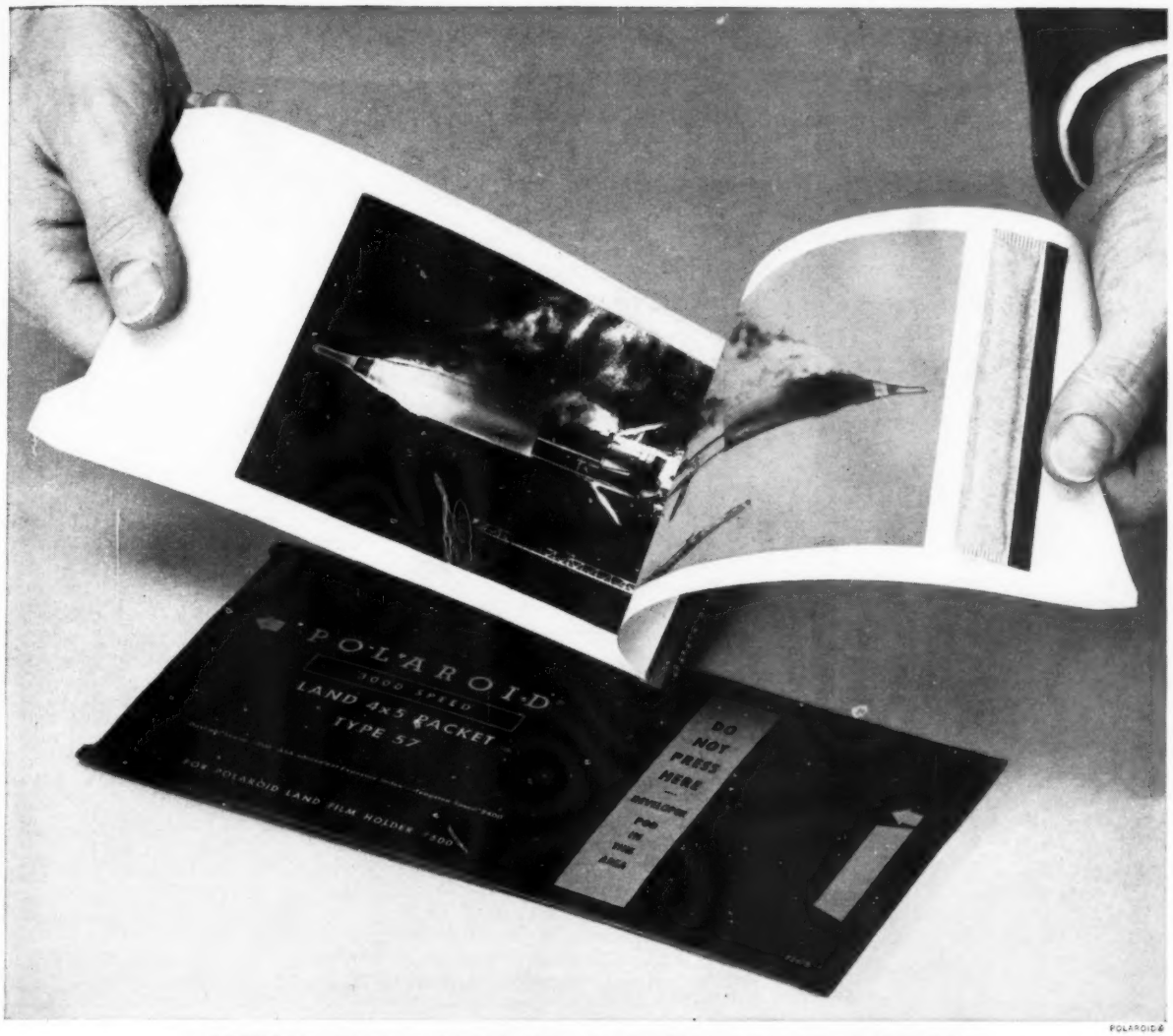
ing anything inside your shutter unless you know what you're doing. Too much lubricant runs into the mechanism, attracts dirt and affects the timing mechanism.) Best way to oil is by applying smallest possible drop by touching the tip of a thin wire into watch oil and then barely touching it to the point of lubrication. One very important thing on roll film cameras, by the way, is to lightly rub a little paraffin onto the small pivots the film spools ride on. Be sure not to use so much that it will fall off into the camera. This trick will help insure smooth, tight rolling and help eliminate static electrical charges.

Some cameras, like the Rollei, that use a knurled wheel against the back of the backing paper, may dislodge fine dust of paint or paper backing from certain film rolls. Be sure to check the place in the camera where this dust deposits (usually right under the counter mechanism) and blow this out just before you change each roll of film.

In checking over your camera in your home-servicing, be sure to check screws, brackets, etc., and see that none are loose and will fall out in the field. If you've had to lift the body leather to tighten anything, or if it has loosened just from hard use and handling, *never* glue it back with glue or cement, else it will have to be torn when the next repair job comes along. Rather, fasten leather down with gasket shellac or bicycle tire rim shellac. They hold tight, but can always be loosened.

View cameras are a special problem for cleaning for industrial photographers, for the pumping of the bellows in focusing, the insertion of film holders for each shot and the interchange of lenses, all help to let dust into the camera. So special care must be taken to clean these regularly. I've discussed this in some detail before (*March 1959*) but a fine gadget for cleaning the inside of view camera bellows (besides a vacuum cleaner) is a small roller with Scotch tape wrapped around the cylinder, sticky side out, called Pixall, at many department stores.

For the *coarse* gears of view cameras and the film roll pivots that go into the spool, I like a waxy material called Door-Ease that hardware stores sell. This makes them turn without binding. For very fine gears, Fulcrum Porpoise-jaw Oil, Nye's Whale Oil, or Elgin's Silicone Watch Oil, are all light and fine enough for fine camera mechanisms.—THE END



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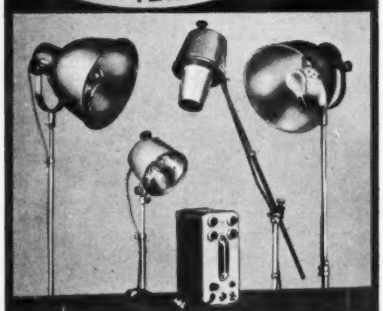

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Get more information. Circle 401, page 75

Edward R. Farber

ELECTRONIC FLASH

On the trail of the elusive hummingbird; intra-oral illumination

Not many books are made possible by electronic flash, but one recently published by Doubleday is just that. It is *Hummingbirds* by Crawford H. Greenewalt, published under the auspices and copyright of the American Museum of Natural History.

The story of this colorful display of original ornithology goes back to 1953, when corporation president Greenewalt (E. I. du Pont de Nemours and Co.) made a few pictures of hummingbirds with the aid of some Heiland Strobonar units. Dissatisfied with the action-stopping ability of the low-voltage electrolytic system, Greenewalt decided that hummingbird photography requires higher voltages for shorter flash durations. He pursued this idea with a lover's passion.

In 1955, Greenewalt wrote MIT's Dr. Harold E. Edgerton that his field tests indicated that a flash duration of "80 to 100 microseconds" might be satisfactory. Greenewalt tried an SR Strob III using three lamps. The flash duration was in the range desired, but it turned out to be still not short enough. Edgerton suggested using low-impedance FT 218 flashtubes, selected specially not to self-fire on the 2650 volts of the Strob III. Another refinement consisted of an air core inductor put in series with each lamp to reduce peak currents and extend tube life.

By 1956, the flash duration was down in the 30-microsecond range, using 14 microfarads with 2650 volts.

Greenewalt wrote Edgerton, "The modified strobe unit works well and I think there is no question but that the 30 microseconds I get with the new unit gives cleaner pictures than the 100 microseconds with the unmodified Strobe III."

There were problems, though. The energy from all four 14 mfd capacitors discharged through one FT 218, shattered the tube. So the Strob III was further modified to connect only one 14 mfd capacitor directly to each tube, preventing failures caused by overloading the flash circuit.

Later Vic Hanson, who heads a du Pont experimental lab, put a vibrator winding around the coil of the Strob III transformer winding, converting it to direct vibrator operation. The 2 x 2 rectifier was replaced with a silicon rectifier stack to further cut energy losses. The 2 x 2 rectifier heater consumed about 12.5 watts continuously. The change reduced idling drain to .7 amperes and permitted the unit to operate all day from a 12 ampere hour nickel-cadmium battery. Finally a new, smaller and more efficient transformer replaced the original one altogether. The much-revised unit was installed in a Halliburton aluminum suitcase. Complete with lamps, the unit weighed 26 lbs.

Were two years of persistence worth the trouble? In January, 1957 Greenewalt was able to write: "I got back two weeks ago from the long-planned trip to Brazil, which was a success in every possible way. I came back with 2000 transparencies of 37 species of hummingbirds, among them the best pictures I have ever taken. I think I can say that the book project is definitely over the hump, and from here out, it will be a matter of filling in the gaps.

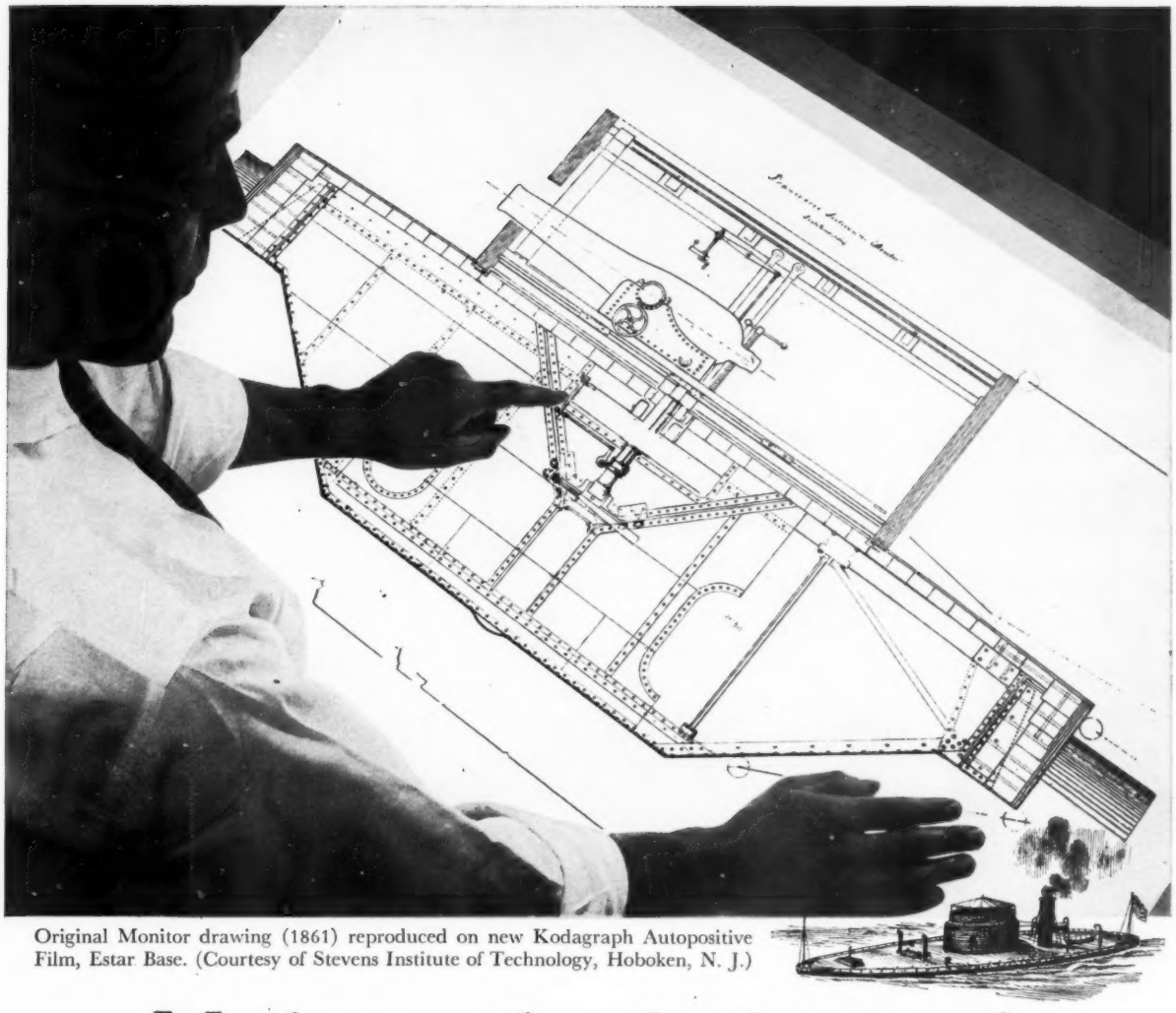
Triple play

"Thanks for all you have done in making the new units possible. I am afraid I have contributed very little

(*continued on page 26*)

—Crawford H. Greenewalt

Test pilot for hummingbird flash: a house wren on the wing, with friend



Original Monitor drawing (1861) reproduced on new Kodagraph Autopositive Film, Estar Base. (Courtesy of Stevens Institute of Technology, Hoboken, N. J.)

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New Kodagraph Autopositive Film, Estar Base, gives you intermediates that are as tough as they come and have exceptionally sharp detail.

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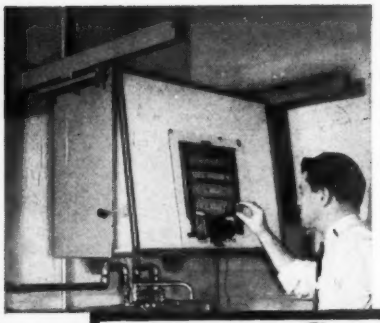

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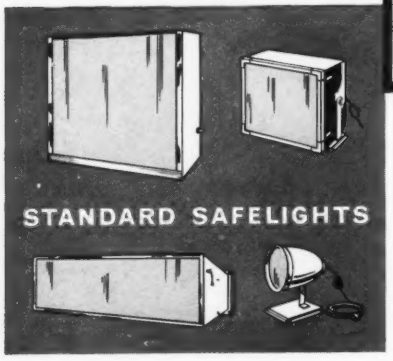

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ELECTRONIC FLASH

(*continued from page* 24)

myself but pressure, and the units themselves, if they ever see the light of day, should properly be called the Edgerton-Farber-Hanson units."

However, to those who have seen the pictures in the November, 1960 *National Geographic* or who have had a look at the book itself, it is quite obvious that it was patience, persistence, and the photographer's skill that paid off. Though the electronic flash unit made the work possible, there is no doubt it was produced by a photographer of exceptional merit.

Mouthful

A novel arrangement for using a ring light is described in EK Co.'s *Dental Radiography and Photography,* Vol. 33, No. 3, 1960. Although built around a Retina Reflex for "Intra-Oral Close-up Photography," the method could have application for close-up shots in a number of hard-to-reach spots. A Mighty Light is used for the power supply. A smaller-than-standard ring flashtube was obtained and encased in plastic so that it could fit snugly around the lens. The trigger coil and capacitor were mounted in a small separate case and fastened on the top of the camera. Iconel (stainless steel) mirrors were fashioned in various shapes and sizes and mounted at 45° angles in front of the lens and flashtube assembly to reflect the light into the oral cavity, and to reflect the image back to the lens. The mirrors are heated before use to prevent fogging by the patient's breath.

Enumeration

After the last Photokina in 1958, this writer described the impressive production lines of Braun (Hobby) in Frankfort, Germany, and told how

Everything's coming up roses for Deutsche Electronik in West Berlin

their product was marketed in every corner of the world. Now an impressive picture comes from Deutsche Electronik, a subsidiary of Robert Bosch GmbH, located in Berlin. It shows the 500,000th flash unit of their manufacture coming down the production line with a garland of flowers. This is a record not to be taken lightly. It would seem that electronic flash is in fashion everywhere these days.

Hot stuff

In-company men will welcome the new 3200 ASA Polaroid Land 4 x 5 film and its 10-sec. development time. Contrast can be considerably increased by developing 15 to 30 sec. Since the original film had a speed rating of 200, a photographer can expose at the same f-stop with only 200-watt-seconds of energy a scene that previously required 3200-watt-seconds. It's nice to have your flash equipment made 16 times brighter.

Brainbuster

At a Wisconsin Industrial Photographers one-day seminar at Layton Art School in Milwaukee recently, Don Mohler of General Electric's Lamp Department discussed lighting with particular emphasis on flash. Since most situations make it impractical to measure or to otherwise predict the result, Don listed sixteen different changes the photographer must mentally evaluate in advance when he *moves* a light:

1. The amount of light (exposure) **2.** Contrast of subject and background **3.** Contrast within subject **4.** Modeling **5.** Shadow size **6.** Shadow edges (sharpness) **7.** Shadow density (blackness) **8.** Highlights **9.** Angle of light **10.** Apparent size of source **11.** "Stars" in subject's eyes **12.** Color of light **13.** Existing fog or haze **14.** Exposure compensation error when close (or reciprocity problems) **15.** Coverage of light (area) **16.** Plug (one is never in the right place). No wonder so many people put their flash on the camera and leave it there.—THE END

75

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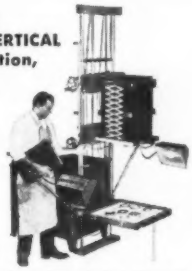

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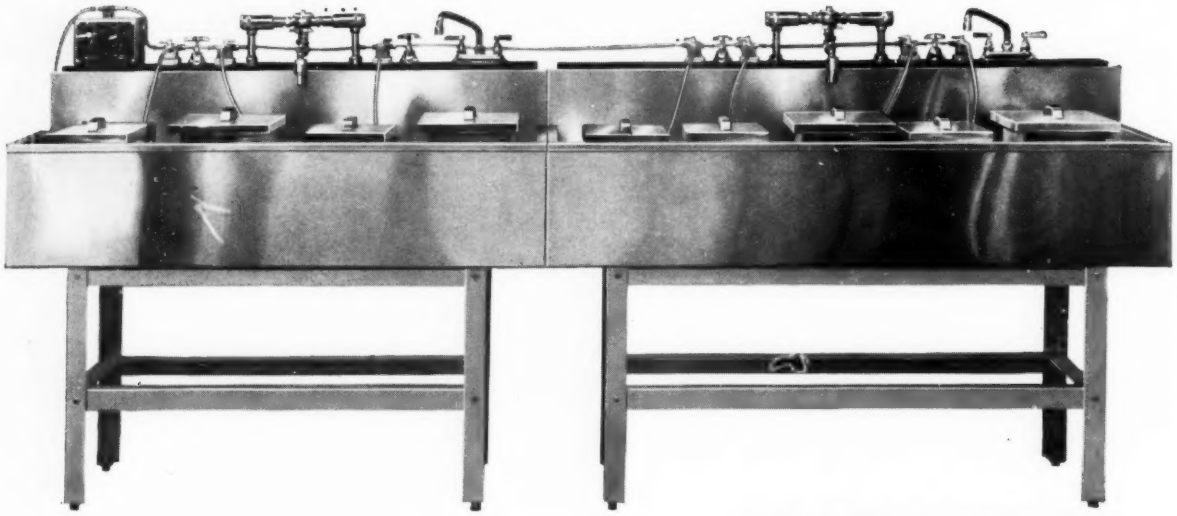

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AN EDITORIAL

GOOD AS HIS LAST PICTURE

The first battle for the in-company photographer is proving that there is a difference between an amateur and a pro. The second point to score is that he is a pro. The third is that truly professional pictures have a value that snapshots do not. This is the groundwork on which practically all the robust in-company photographic units have been established. ■ With 50 million photo hobbyists in the country, there's bound to be a reasonably competent amateur around to blur the line of demarcation, thereby undermining the photographer's prestige. But the respect a photographer commands as a craftsman and artist is all he has beyond a winning personality. ■ Some in-company men, sensing the threat of the amateur, have taken dramatic steps to combat it. A few have re-shot photographs made on company time by amateurs to show, by contrast, what the organization has a right to expect. A few have put their foot down when asked to reproduce inept pictures for a formal report. Some have decided to take the opposite tack and join 'em. They go out of their way to equip company personnel with cameras, film, instructions and photofinishing—winning friends and clarifying the distinction between the jobs that take a pro and the jobs anyone can do. ■ There are still other ways of winning the day. One is to forget economy and convenience for the moment and make every functional picture, even the lowliest, with a camera no amateur would use—an 8 x 10. Then title and date it with clean type, opaque it, retouch it—do anything necessary to make it unmistakably professional. If the miniature camera is treated with mistrust—or overfamiliarity—one way out is to show nothing but big prints, 11 x 14, or 16 x 20. ■ The important thing to avoid is releasing a sub-standard print. People easily forget quantities. Rarely, indeed, do they know what they mean. But a few amateurish prints can be a photographer's indictment. This people recognize; they've seen any number of poor prints in their family albums.

The Editors

PILOT COLOR PRINT LAB

Jack Allsup made haste slowly to introduce color to himself and management in his $200 basement lab

How much do you think it costs to get into color printing? $1000? $2000? $5000? Jack Allsup, photographer at A. E. Staley Mfg. Co., figured it would be close to $5000. But he thought that with about $200 worth of extra equipment, he could convert his own well-equipped basement darkroom into a working color lab. This would enable him to offer color service to his company, saving them not only money but time.

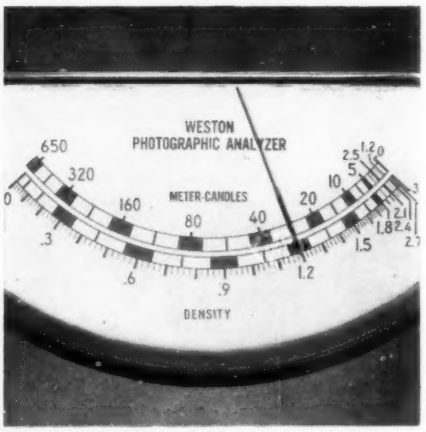
Accordingly, in August 1958, at a meeting to discuss the preparation of the Annual Report, Allsup went out on a limb and offered to make color prints for the cover. At the time, he had never done any color work and he wasn't sure he could. It is a well-known truism that if you have to do something, you usually can. He figured that by using his prints, made to size, the company would save about $600 on four-color separations. Usually, they were made from color transparencies and magnified or reduced to size in the process camera.

Management took him up on the offer and gave him the money. Most of it went for a Weston No. 877 Analyzer ($135) to give Allsup his exposure readings. He did not use this instrument for color balance. Instead, he used his eyes. Allsup explains that he had taken these pictures himself and knew what they were supposed to look like and that he sometimes tried for special effects by changing the technically-correct color balance. The rest of the money went for extra trays, some Kodak Data Books and a set of filters.

The filters he uses are Yellow and Magenta in 40, 20, two 10's and a 5. He also uses a 2½ CC. He bought only the minimum equipment needed to get started, feeling that "you should learn the process step by step and then figure out what piece of equipment suits *your* needs. There is a lot of equipment on the market and it takes time to find just the right items."

One very important accessory, a constant voltage transformer, was borrowed from the Research Lab. Allsup took it home nights for over a year before getting one all his own, a

Plastic Tanks. Allsup made these for C-22 Processing. A gallon kit is enough to process 24 sheets of 4 x 5 film. Most of Allsup's equipment is store-bought.



Weston Analyzer. This was used for exposure determination only, not for reading color. Allsup took highlight reading, used Data Book for exposure times.

Reference Shelf. Kodak Dye-Transfer Data Guide provided exposure times. Other Kodak literature provided basic techniques. Allsup kept careful records of his work.

500-watt GE. He feels that it is best to allow a little extra capacity because you never know what equipment you might add which will increase the load on the electrical system.

His enlarger was an Omega D2 with a 135mm Raptar lens. Originally he worked with only the condenser head but last spring, he ordered the Chromega head. He feels that while the resulting prints do not seem as sharp as those made with the condenser head, all things considered it turns out a better looking 16 x 20 from a Rollei negative.

The photos for the cover were shot on 4 x 5 Ektacolor and 120 Kodacolor film. He made the prints to size, saving part of the printing costs as promised. In addition to the saving in cost, he found that it was easier for management people to judge prints in color than to judge transparencies. Allsup feels that no two people see transparencies in just the same way. The results being satisfactory in terms of cost and quality, he began getting orders for more color work. This work was done in his darkroom after hours.

He feels that the investment in time has more than paid off in extra prestige for himself as a professional photographer and in a bigger pay check. "I did not ask for overtime, although the company would have paid it. This would have made color so expensive in terms of my labor that they would have dropped the idea of an in-plant color section."

Allsup is still working in his darkroom at home, although he plans to move into the plant darkroom shortly. There have been some changes along the way but his method is still the simplified approach, without unnecessary frills.

It took Allsup about 12 hours to make his first print. The first session (3-4 hours) was devoted to exposure. The second session explored color balance while the third and fourth sessions were devoted to getting his print. Today, it takes him about four hours. He makes three prints for every picture, one slightly under, one slightly over and the third, correct. It is important that the photographer not be satisfied with his first print. Allsup says that there is no print which could not be improved and that it is important not to promise too much too fast. Quality is more important than speed and if color is to be sold successfully, it has to be good. The competition is from first-rate outside labs which, in some cases, can offer cheaper service. However, Allsup feels he offers better quality and shorter delivery time since the nearest labs are in Chicago, about 150 miles away from the plant in Decatur.

For temperature control he uses $5 lab-type thermometers, feeling that the dial-type are not accurate enough. He suggests that the photographer get two, using one and keeping the second as a master thermometer with which the other can be compared. "You can't tell if a thermometer gets out of order," states Allsup, "and you get all sorts of trouble that you can't trace unless you can check your thermometer."

To keep his solutions at the proper 75°F level, Allsup uses the basement water heater. About 45 minutes before he is ready to develop, he turns on the heater. The heat from the metal heater jacket is sufficient to raise the basement's usual 70°F temperature to the proper level (solution temperature of 75°F) and keep it there during his session.

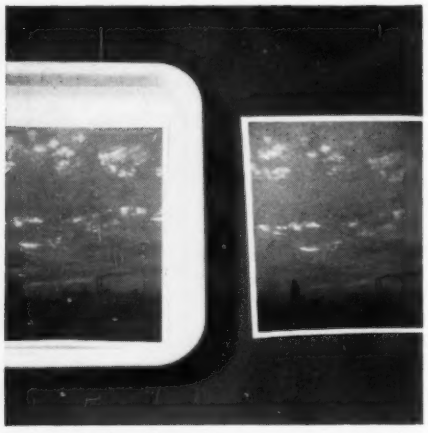
His first paper order was 25 sheets of 8 x 10. Now he orders

Filters. This is set used, consisting of Magenta and Yellow in 5, 10, 20, 40 plus a 2½ CC. Keeping things as simple as possible makes step-by-step control easier to handle.

Enlarger. A condenser D-2 was used for all printing. Now, a Chromega head was added to handle larger prints from roll-film negatives. CP filter is placed in position.

Exposure Control. Lens is adjusted to give variation in exposure. Allsup makes three prints of each negative to insure best results, using slight over-, underexposure.

Processing. Set-up uses P-122 Process. The first developer is discarded after each session. Other chemicals, however, can be stored and reused until limit is reached.



Print Evaluation. Always wait until color print dries before evaluating it. Quite often, there is slight color change so that dry print does not look the same as when wet.

Viewing Light. For consistent results, a standard viewing light source must be used. Allsup uses a combination unit with a blue and standard bulb for judging his results.

300 sheet of 16 x 20 at a time and cuts them up if 8 x 10's are needed using a Nikor trimmer. Ordering in large quantities of a single emulsion batch makes possible the use of a master filter pack. Allsup finds the filter combination which gives him the best prints, then uses this combination for all succeeding prints on that lot of paper.

In December 1959, Allsup added a Model 2 Densichron to his equipment in place of the densitometer. In April of 1960 came the Chromega enlarger head and in July, a Calumet 16 x 20 processor. The total cost of this equipment was $3000. Now installed in the basement, it will be moved to the photo lab when it is ready early this year.

Allsup waits until the print is dry before trying to evaluate it. He air-dries prints by hanging them from a line with an ordinary clothes pin. He does not use a safelight in his darkroom, feeling that he can print without worrying about the possible degraded whites caused by safelight fog. He views prints with a unique Y-socket lamp: one side has a 75-watt frosted bulb; the other, a 75-watt blue bulb. Somehow, the two bulbs combined give him the desired viewing light, and provide a handy, standard print illumination.

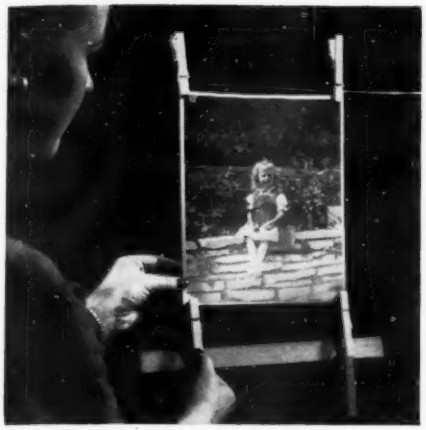
His basic advice is to be consistent in everything you do. Even if you make mistakes, he advises that they be consistent until you can eliminate the cases one by one.

As for the first color print, don't start with sunrises or sunsets. Use negatives you know so that you will be able to judge how good your color and exposure are. Don't expect success on the first try. Allsup feels that too many people try to knock out a color print, do careless work and get poor results. Then they complain that you need a professional darkroom for good work.

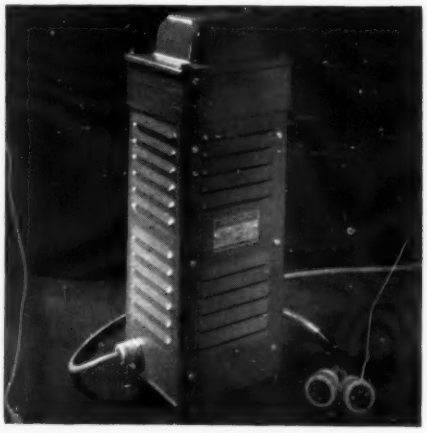
Allsup joined A. E. Staley, a corn products manufacturing company (cooking oil, corn starch, etc.), about three years ago. The firm had had an in-plant section only since 1953 when a camera was shoved into the hands of a worker and he was told to take pictures. He managed, combining some experience and talent with aid from Kodak's tech reps. After about a year, an ex-newspaper type became the plant photographer. When he left, Allsup became the plant cameraman.

As he saw the situation, it was up to him to show the company how important he could be and to raise the prestige of the photo department. This was the basic thinking which led to his now-successful trip out on the limb. Despite the 20 or so extra hours he puts in working in his darkroom, he has no regrets. It is up to the photographer to put himself out a little if he wants to convince management that he is worth the increased pay and responsibility.

One result of his efforts is that Allsup is now consulted on the company's color needs. As a consultant, his policy is always to give a definitive answer to a problem or make a positive suggestion. It is better, says Allsup, to be wrong than to appear uninterested or non-committal. It also forces the photographer to think in terms of company needs, not departmental interests. Allsup feels that "too many photographers try to see how much they can get from the company, rather than how much they can contribute. This, I think, is the mark of a professional."—THE END



Drying Prints. Allsup follows recommended method of drying prints, hanging them from ordinary clothes pins for air drying. Using heat may distort color values.



Transformer. A necessity for consistent work is this constant voltage transformer. It should have a high-enough capacity to be able to handle future electrical needs.

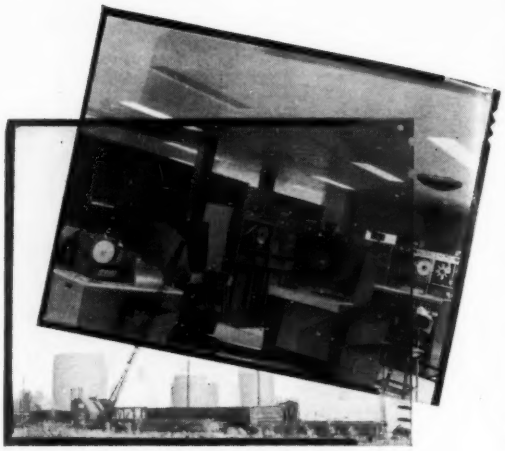
Basic Books. Before starting work, the cameraman should get these two publications which contain a basic working knowledge needed to start a color program.

GUIDE TO COLOR CONTROL

This chart presents some of the variables in color processing and the methods Allsup used to control them. The less control you have the more apt you are to find color printing difficult and suited only for professional labs. Everything required for these procedures should be in a normally well-equipped black-and-white darkroom plus the $200 initiation fee for color.

VARIABLE	CONTROL
emulsion-to-emulsion differences	Buy film and paper in quantity, store for optimum life.
differences in scene illumination	Don't start with sunsets, shoot a normal scene with normal lighting for your first try.
film development	Follow directions to the letter; or send film to a processor you know is reliable.
negative densities	Measure highlight density with a reliable instrument; Allsup's was Weston Analyzer.
magnification	Calculate effect of various enlargement with a slide-rule type computer.
enlarger lamp	Burn-in enlarger lamp. Throw out lamp before end of its rated life. Keep voltage constant with adequate regulator.
processing temperature	Stabilize darkroom air temperature before beginning processing. Measure solution temperature with a quality lab thermometer (mercury bulb type) double checked for accuracy against a master thermometer.
print exposure time	Meter exposure with print timer checked for accuracy. Try to keep exposure time the same for all exposures.
filter variations	Make up a filter pack and use it. Try to avoid reshuffling filters.
technique	Keep the same technique (agitating method, time lag from exposure to developing, etc.). Iron out one variable at a time.
change in wet to dry prints	Don't judge a print till it's dry.
print changes due to drying heat	Air dry prints at room temperature.
differences in viewing lights	Set up a constant viewing source (about 4000K) and judge prints and tests with it only.
subjective variations	Keep cool, take your time, try to make prints consistent even if they are consistently wrong while you adjust one variable at a time. Don't get yourself into a bind by promising too much—especially at first.

DIRECT POSITIVE



The Arneleon System—so christened by its inventors, Dr. C. Arne Arenberg of Evanston, Ill. and Leon Witten of New Rochelle, N. Y.—is the most recent development in the old black magic of processing a negative camera film to a positive transparency.

The idea is to use black-and-white much as one would use color, for such purposes as engineering reports, training programs and other visual presentations. No one could argue that color is absolutely necessary for every scene in a slide show, and some would say that the occasional use of black-and-white helps liven things with variety. Besides, black-and-white has some advantages all its own, namely lower film costs, better rendition of scenes illuminated with mixed light sources and a wider choice of more sensitive films.

Bad luck in trying to exploit this latter virtue stimulated Arenberg and Witten to develop their system. Except with a narrow range of slow films, results with existing formulae and many of today's high-speed good-quality films were, to put it charitably, miserable.

It's still a tricky business, but the inventors feel they have it to the point where a careful worker can, after a few test runs, get a most pleasing, full toned, good quality transparency with any film of his choice.

This goes for even the fastest of films, Isopan Record and Royal-X Pan, but of course the results are consistent with the general characteristics of the film. The old rule that slower films usually have better quality still holds. The processing steps are conventional for reversal processing, except that Arneleon eschews a fogging developer for second development and obtains its reversal through re-exposure instead. The steps are: first development, bleach of the negative image, lights on, clearing bath, re-exposure, second development, short stop, fix and wash, neglecting intermediate rinses for the moment.

The secret of the system is to tailor the processing chemicals and their dilutions to the film. To do this Arneleon divides most of the films on the market into two main groups with a number of sub groups. Variations of two basic developers are able to encompass the characteristics of all these films. In many cases however quality is obtained at some sacrifice of film speed. Here's the classification, with film speeds:

ARNELEON CLASS I	ARNELEON CLASS II
IA 20-32 ADOX KB14 ADOX R14 AGFA IFF PERUTZ 14 ILFORD PAN F	IIA PLUS-X PAN 80-160 PORTRAIT PAN 50-100 ILFORD FP3 64-125 VERSAPAN 50-100
IB 40-60 ADOX PL17 ADOX KB17 ADOX R17 AGFA F PERUTZ 17 PANATOMIC-X (25 to 50)	IIB VERICHROME PAN 80-160 ILFORD HP3 160-320
IC 100-160 ADOX PL21 ADOX KB21 ADOX R21	IIC TRI-X PAN 200-500 SUPER HYPAN 250-500 ILFORD HPS 400-650 SUPER PANCHRO-PRESS 125-250 SUPER-XX 100-200
ID (T400, D250) AGFA ULTRA	IID ROYAL-X PAN 650-1200 AGFA RECORD 650-1200

In order to simplify tailoring the developer for the film, the system uses stock solutions of the various constituents. These should be prepared beforehand and allowed to cool. Store in tightly stoppered brown bottles. The formulary is:

METOL SOLUTION	
WATER (125F)	750CC
METOL	10GMS
SODIUM SULFITE, DESSICATED	50GMS
WATER TO MAKE	1000CC

SODIUM CARBONATE SOLUTION	
WATER (125F)	750CC
SODIUM CARBONATE, DESSICATED (117gms if monohydrated)	100GMS
WATER TO MAKE	1000CC

THIOCYANATE SOLUTION	
WATER (125F)	200CC
SODIUM OR POTASSIUM THIOCYANATE	25GMS
WATER TO MAKE	250CC

This quantity is sufficient for about 25 rolls of 120 film or about 100 sheets of 4 x 5 film.

SODIUM HYDROXIDE SOLUTION	
COLD WATER	400CC
SODIUM HYDROXIDE	50GMS
WATER TO MAKE	500CC

Handle with care. Weigh sodium hydroxide rapidly as it absorbs moisture from the air. Add slowly with constant agitation, and make sure the water is cold; this chemical heats water quickly, and could spatter causing burns. Store the solution in a polyethylene bottle; strong alkalis react with glass. Keep bottle well stoppered to prevent combination with carbon dioxide from the air which will weaken the solution. Label the bottle, *Caution, Caustic.*

HYPO

WATER	750CC
SODIUM THIOSULFATE	100GMS
WATER TO MAKE	1000CC

BLEACH

WATER	750CC
POTASSIUM DICHROMATE (bichromate)	12GMS
SULFURIC ACID (concentrated)	15CC
WATER TO MAKE	1000CC

Caution: Add the acid to the dichromate solution; never add water or solution to concentrated sulfuric acid. Spattering may cause severe burns. Stir the solution constantly while adding acid slowly. Label the bottle: *Caution, Acid.*

CLEARING BATH

WATER (125F)	800CC
SODIUM SULFITE (dessicated)	100GMS
WATER TO MAKE	1000CC

Both the bleach and the clearing bath are capable of handling about 20 rolls of film or about 80 4 x 5 sheets.

The best water to use for all the solutions is distilled water. Short of this, use de-ionized water, or, if necessary, iron-free, filtered tap water.

The following tables for mixing up the Arneleon first developers should be followed to the T. These are single-use developers. The capacity of a pint of solution is one roll of 120, one roll of 36-exposure 35mm film or four 4 x 5 sheets. For roll film, the best tank to use is one which can be inverted for agitation, such as the Nikor tank. The developers should be mixed, then allowed to stand for 15 min. before use.

ARNELEON I

FILM CLASS	IA	IB	IC	ID
METOL	40CC	40CC	40CC	40CC
SODIUM CARBONATE	40CC	20CC	20CC	20CC
SODIUM HYDROXIDE		3CC	3CC	10CC
HYDROQUINONE		20CC	40CC	60CC
POTASSIUM OR SODIUM THIOCYANATE	10CC	10CC	10CC	10CC
WATER TO MAKE	1 PT.	1 PT.	1 PT.	1 PT.

ARNELEON II

FILM CLASS	IIA	IIB	IIC	IID
METOL	40CC	40CC	40CC	40CC
SODIUM CARBONATE	20CC	20CC	20CC	20CC
HYDROQUINONE	20CC	40CC	60CC	80CC
SODIUM THIOSULFATE (Hypo)	40CC	40CC	60CC	60CC
SODIUM HYDROXIDE	10CC	10CC	10CC	10CC
WATER TO MAKE	1 PT.	1 PT.	1 PT.	1 PT.

Second developer

The purpose of the second developer is to reduce all the silver ions left in the film after the bleach and clearing of the original, negative image. Because this is a total development, it makes very little difference as far as grain and sharpness are concerned whether a powerful or a weak developer is used. A standard print paper developer, therefore, provides the advantages of speed and convenience, and has no drawbacks. Arenberg and Witten highly recommend Ansco 130, Edwal 102 and Edwal 111, all of which contain glycin. They feel that such a developer removes the possibility of dichroic fog. The print developers should be diluted as they would be for enlarging papers. Use the standard print paper development times and slow, continuous agitation.

Processing temperatures

An attempt should be made to keep the processing temperatures of all solutions within 2 or 3 degrees F of the first developer.

Maximum developing temperature is kept low to prevent frilling of the gelatin due to the presence of sodium hydroxide.

Except for the first development, the processing for all films is identical. The second developer, short stop, fixer, hypo, clearing agent and wetting agent can be any proprietary solution, except that the fixer should be of the hardening. type.

Processing steps

1. First Development

a) Arneleon I: 10 min. at 65F. Agitate the first 15 sec., then 10 sec. every 30 sec. Agitation should also be gentle; for example, one inversion per sec. for Nikor-type tanks. b) Arneleon II, 10 min. at 68F. Agitate the first 30 sec., then 5 sec. every 30 sec. *All steps from here on are the same for both Arneleon I and II.*

2. Wash. Five min. in rapidly running water, 65-68F; or 10 water changes in 10 min.

3. Bleach. Three min. at 65-68F; agitate continuously first 30 sec., then 5 sec. every 30 sec.

4. Wash. Three min. in rapidly running water. *Normal room lights may be turned on during the remaining processing time.*

5. Clearing Bath. Two min. at 65-68F. Agitate as for Bleach. Do not keep in this bath for more than 2 min., as image quality will degrade.

6. Wash. Three min. at 65-68F.

7. Rinse. Twenty sec. in water containing a few drops of a wetting agent.

8. Exposure. Hold film 12-14 in. from a lighted 100-watt bulb, 30 sec. for each side. Oscillate wire reels. Plastic reels with only one clear end should be exposed for 2 min. A 36-exposure length should be removed, otherwise unevenness of exposure may result.

9. Second Development. Same time as for enlarging paper at 65-68F. Slow, continuous agitation. Film edge should be jet black.

10. One-shot acid short stop. One min., continuous agitation.

11. Fixing. Fixing bath should be of the hardening type, since the emulsion is very soft from sodium hydroxide. Time as per manufac-

(continued on page 79)

TROUBLE SHOOTING	REMEDY	
FAULT	ARNELEON I	ARNELEON II
EDGES TOO THIN, IMAGE TOO THIN	CUT DOWN ON THIOCYANATE IN ARNELEON I	CUT DOWN ON HYPO IN ARNELEON II
EDGES BLACK BUT IMAGE TOO THIN	OVEREXPOSURE, USE A HIGHER FILM SPEED	
EDGES BLACK BUT IMAGE TOO HEAVY	UNDEREXPOSURE, USE A LOWER FILM SPEED	
CONTRAST EXCESSIVE FOR A NORMAL SCENE	CUT DOWN ON HYDROQUINONE IN ARNELEON I & II	
HIGHLIGHTS NOT CLEAN NO OVERALL FOG	UP THIOCYANATE IN ARNELEON I	UP HYPO IN ARNELEON II
HIGHLIGHTS NOT CLEAN OVERALL LIGHT FOG	ADD ANTIFOGGANT TO SECOND DEVELOPER, OR BEST USE EDWAL 102 DEVELOPER	

RESEARCHER'S REPORT

Kodak Engineer Herbert S. Glick describes how new ideas and materials can make the large industrial darkroom more convenient, safer and more efficient

In the usual lighting installation, time is generally of little importance to the effect of the light. In the photographic darkroom however, time is very important because the effect of light on emulsions is cumulative.

The color of the light plays a part in darkroom lighting which is quite different from the one it has in ordinary lighting systems because the spectral composition of the light is of decisive importance to its effect, not only on the eye, but on the photographic material.

The primary aim in darkroom lighting is to provide the greatest amount of useful visual light possible without damaging the product. This may be accomplished by placing the visual light where it will do the most good and keep it from falling on exposed product as much as possible.

Some preliminary points involved for providing illumination in a given workroom are:

1 The sensitivity (speed) of the emulsion to be handled; **2** The spectral sensitivity of the product; **3** The spectral sensitivity of the eye; **4** The spectral absorption of the filters; **5** Spectral energy distribution of light source; **6** The time factor or duration of exposure; **7** The purpose of the safelight for determining: (a) Physical size, (b) Angle of propagation, (c) Intensity; **8** The general engineering and construction details of the safelights and their placement and distribution to provide optimum performance under the conditions demanded for product quality and job performance.

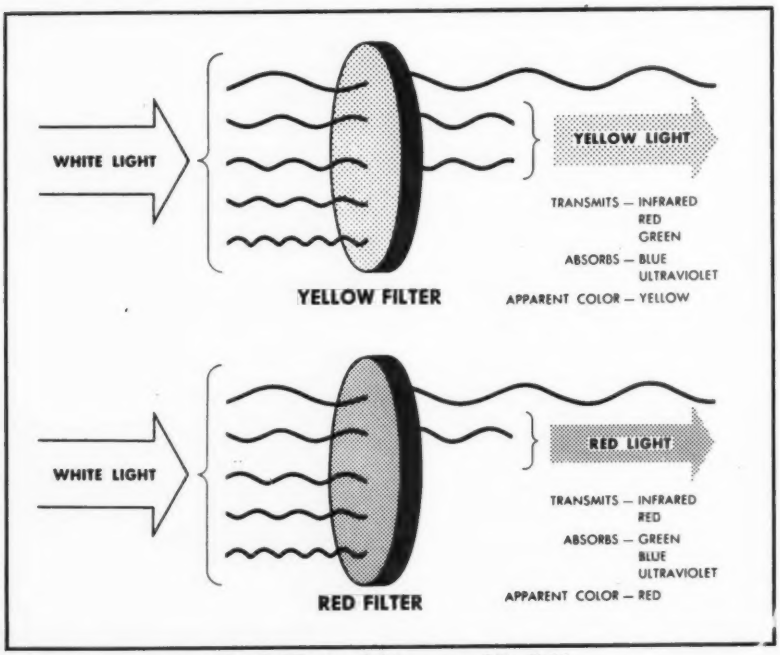


Fig. 1 Effects of filters on white light

The use of controlled lighting in darkrooms produces the most efficient lighting in terms of usable light per minute of safety time. General room illumination is quite satisfactory when the allowable level of illumination is relatively high, but when it becomes necessary to operate at low levels of illumination, general room lighting is eliminated and the light confined to areas which must be seen.

Specular light, or light coming from a point source such as a lamp filament, is much more easily controlled than is diffused light—light coming from an area source such as an opal glass screen or an electroluminescent panel.

In darkroom areas where there is heavy traffic, emphasis should be placed on lighting the aisles and doorways. Closely associated with aisle lighting is the principle of silhouette lighting which involves the placing of lights so that a person or obstacle between the observer and the light will be visible as a shadow or silhouette.

Further application of controlled lighting is found in workplace lighting. Workplace lighting is con-

fined, by the use of shields and hoods, to the immediate area which must be seen. The intensity is then adjusted to provide adequate safety time for the product being handled.

Safelight filters

It is the function of the filter to transmit a maximum of visual light to which the material is least sensitive. A filter is a device which transmits light of a certain color while it absorbs light of other colors. A filter never "changes" the color of light. It can only allow a part of some colors to pass through and stop other colors. A "red" filter appears to be red because it transmits red light to the eye and absorbs most other colors (*see Fig. 1*)

In Fig. 2, the color sensitivity of the eye is shown and compared with photographic materials. This illustration shows that for certain photographic materials it is possible to select a filter which will transmit light which the eye can see but which will be relatively safe for the product. On the other hand, panchromatic materials have a wide sensitivity which approximates that of the human eye so that the latter approach is not possible. In this case, a filter is selected which will transmit only an extremely small amount of light which is near the maximum sensitivity of the eye. This light is not safe for such film except under very carefully controlled conditions.

Safety of safelights

Any photographic material will fog if left long enough under safelight illumination. This occurs not because the safelight transmits any light which it should not, but because even non-color sensitive materials have some sensitivity to green, yellow, and red light. This sensitivity is not sufficient to be useful in picture taking, but it is enough to cause fog with prolonged exposure under a safelight.

The efficiency of light production for white light areas is the lumen output per watt of power input. The efficiency of a white light luminaire is usually arrived at by taking all losses into consideration to arrive at the useful light which is available. For a safelight, however, the efficiency must take into consideration the effect of the safelight on the photographic material. Inasmuch as there is no practical "absolute efficiency" rating which can be applied to a safelight, the usual

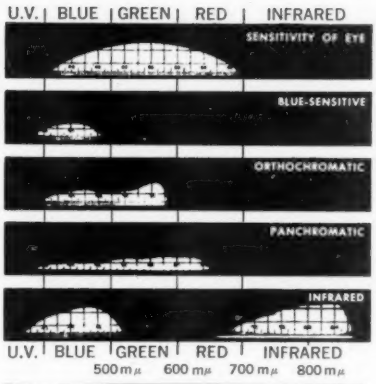
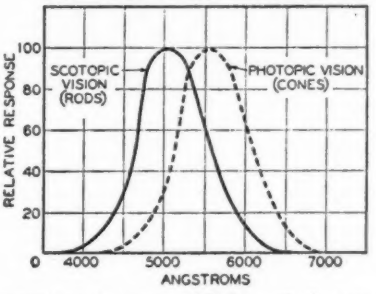


Fig. 2 (above) Fig. 3 (below)



practice is to establish a "relative efficiency." This efficiency is established by comparing one safelight with another. In 1927, Arens and Eggert[12] published a paper on darkroom lighting in which they define the "safety ratio" of two safelights as the ratio of the time required by the two safelights to produce the same photographic effect (fog), the brightness of the two lamps being identical. Relative efficiency may also be defined as the relative safety time at equal levels of darkroom illumination.

Position of safelights

General Room Illumination. When the allowable level of illumination is relatively high, general room illumination may be used. For this the general purpose 10 x 12-in. safelight hung from the ceiling with chain is usually employed. The housing may be hung either for direct or indirect lighting.

Floor Lighting. Where the allowable level of illumination is relatively low and general room illumination cannot be used, luminaires should be arranged to illuminate the floor and aisles. This involves placement of lights so that a person or obstacles between the observer and the light will be visible as a shadow or silhouette. Safelights usually used for these applications are the recessed wall safelight, the sealed beam recessed floor safelight and electroluminescent safelight panels.

Workplace Lighting. Lights over work places are often necessary to provide as much light as is allowable for performance of a given task. Although the housings most frequently used for these applications are the general purpose 10 x 12-in. and the beehive type safelight, sometimes smaller housings are necessary and often a special housing must be designed. Where the material is extremely sensitive, it is sometimes necessary to turn the light off during part of the processing cycle.

Obstruction Marker Lighting. In the absence of general illumination and where only very low levels of illumination can be tolerated, it becomes increasingly important to clearly mark obstructions which could result in personal injury or property damage in darkrooms. Such obstructions, which often require lighting, are columns protruding into aisles; corners of tables; work places, and machines; wall projections; partition corners, etc. Where applicable, electroluminescent safelight panels are finding increased usage for this.

Doorway Markers. Where only very low levels of illumination are permissible, it becomes increasingly important to mark door openings between darkrooms. Recessed wall lights and electroluminescent panel lights are usually used.

Safety time

Inasmuch as the safety time at any particular point in a darkroom is not determined by one particular light but rather all the lights in that room, adjustments after the initial installations are frequently necessary. Adjustments would involve changes in lamp sizes, filter diffusion, and shielding. When these do not produce the desired effect, the removal or addition of safelights or changes in locations would be required.

Inspection lights may be an integral part of a machine or they may be separate units. In all cases they are usually specially designed and constructed to meet the particular needs of a specific operation.

Through the process known as adaptation, persons entering darkrooms from white light areas are able to adjust their vision to the extremely low levels of many of our darkrooms. The length of time

required for the adaptation to very low levels may take from 20 minutes to one hour or longer. However, adaptation from low to high levels of illumination takes place much more rapidly. Persons normally working in darkrooms who leave for short periods to enter white light areas will lose their dark adapted vision very rapidly and regain it very slowly upon reentering a darkroom unless suitable precautions are taken. To avoid undue loss of dark-adapted vision, areas immediately adjacent to darkrooms should be provided with subdued lighting. Subdued lighting is not safe for sensitized materials. Acceptable methods for providing subdued lighting include:

1 Safelight housings equipped with amber filters; **2** White lamp luminaires equipped with yellow incandescent lamps; **3** Fluorescent luminaires equipped with gold fluorescent lamps.

Yellow light is used because, although vision is entirely colorless, in very dim light the eye becomes relatively very sensitive to energy at the blue end of the spectrum and almost blind to red. For someone leaving a darkroom, therefore, the presence of light containing blue would cause a rapid loss of dark adaptation. White light without blue, usually referred to as "minus-blue," produces the yellow sensation which retards the rapid loss of a worker's dark adaptation.

Purkinje effect

The eye has two different light-sensitive organs: the cones, which are responsible for vision in fairly high light levels, photopic vision; and the rods, in which vision originates in case of low level illumination, scotopic vision. At very low levels of illumination, where the brightnesses are of the order of 0.001 footlambert or less, the cones no longer function and the rods take over the entire seeing process. In rod, or scotopic vision, a new sensitivity curve becomes effective, of the same shape as the photopic curve but displaces 480 angstroms towards the blue end of the spectrum. This shift, known as the Purkinje effect, places the maximum sensitivity of the eye at 5070 rather than at 5550 angstroms. The result is that in dim light, although vision is entirely colorless, the eye becomes relatively very sensitive to energy at the blue end of the spectrum, and almost blind to red. Thus, if a beam of red light and a beam of blue light, of equal intensity at photopic levels are reduced in the same ratio to the region of scotopic vision, the blue light will appear very much brighter than the red. The implications of the Purkinje effect are important in lighting installations involving very low illumination.

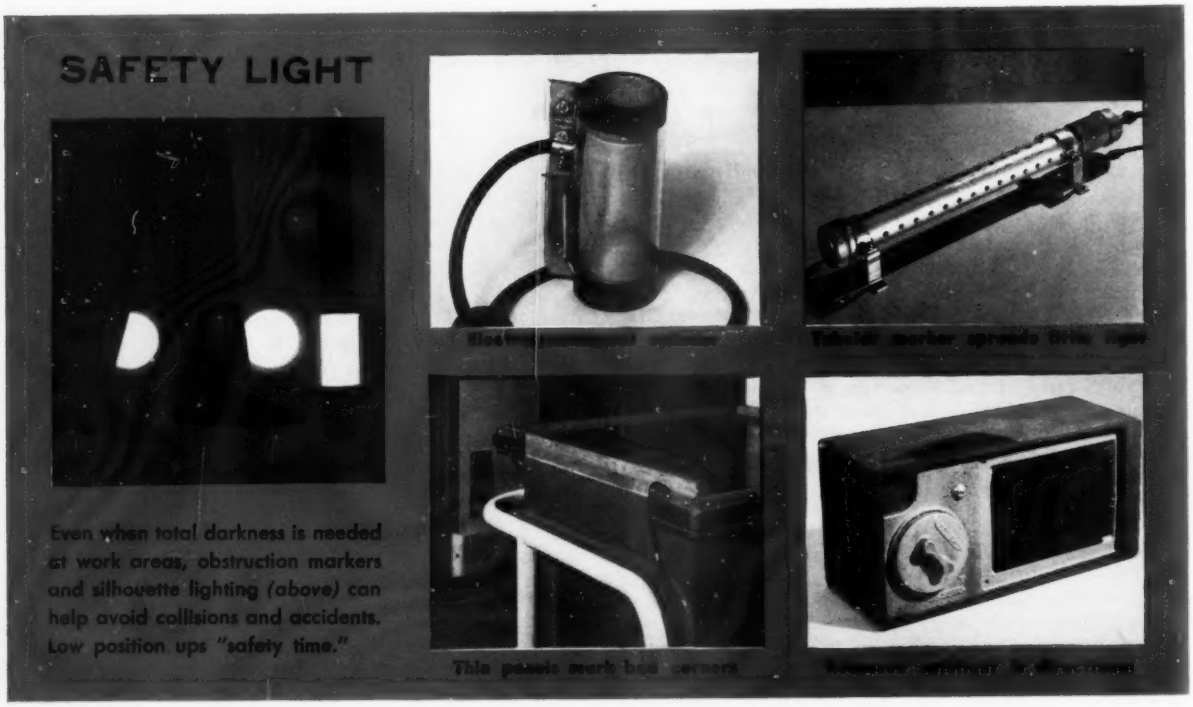
Adequate provisions must be made for white light in all darkrooms for periodic maintenance. The two commonly used methods for accomplishing this are a completely separate and independent white light system or white light extensions, plugged into drop cords located in each darkroom.

Darkroom light sources

The near ideal light source for darkroom lighting would have characteristics as follows:

1 A spectral energy distribution which would provide a minimum of harmful radiation for sensitized materials and a maximum of visual radiation; **2** Adaptability in size and shape; **3** Extreme simplicity and the absence of auxiliary operating devices; **4** Ruggedness to withstand rough handling, vibration, etc.; **5** Extremely long life; **6** Low or moderate initial and operating cost; **7** Ease of maintenance; **8** No harmful effect on filters.

The addition of the following


SAFETY LIGHT
Even when total darkness is needed at work areas, obstruction markers and silhouette lighting (above) can help avoid collisions and accidents. Low position ups "safety time."
This panels mark box corners

characteristics would, perhaps, result in an ideal light source:

9 A light source with a spectral energy distribution which would match the spectral energy distribution obtained with an incandescent lamp and safelight filter combination so that no filter would be required. **10** A single light source with a variable spectral energy distribution which could be controlled for use where more than one classification of sensitized material is handled in the same room or on the same machine. Easy adjustment of the light output of the source without changing its spectral quality would also be desirable.

The incandescent lamp has been the principal darkroom light source for over 45 years and still continues to be so. It has a spectrum which is continuous so that, by means of suitable filters, it is able to fulfill the varied requirements for safelight use. The incandescent lamp, however, despite its wide-spread use is far from ideal for industrial darkroom use. Its disadvantages:

1 Visual efficiency of an incandescent lamp is very low. For example, a 10-watt lamp radiates only 7.1 per cent light while 86.4 per cent of the radiation is in the infrared and the balance is lost to the bulb and base. The high percentage of infrared is not only wasteful but the heat causes filter deterioration; **2** Lamp life is relatively short even when lamps are operated undervoltage; **3** In many cases it lacks adaptability in size and shape of the fixture.

In 1953 an investigation was made to determine the practicability of using fluorescent lamps in darkrooms. Their relatively long life and cool operation were two important advantages over incandescent lamps. Some interesting possibilities investigated included coating the filter onto the lamp; a tubular filter which could be slipped over the lamp, and coloring the glass lamp envelope to obtain the necessary light absorption. Disadvantages of the fluorescent lamp include the need for auxiliary operating equipment, and the possibility of mercury contamination.

Because all the energy emitted is so near the maximum of the eye sensitivity curve and this color would be suitable for many papers and some film such as X-ray, the use of sodium lamps as a darkroom light source has been suggested

(*continued on page* 80)

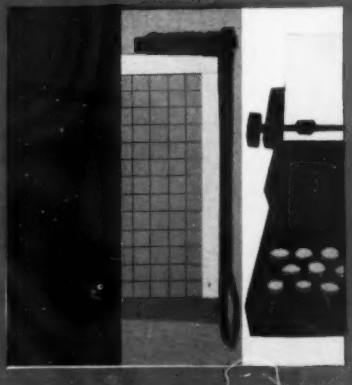
SPELL IT OUT

Electroluminescent panels can be masked to spell out locations of exits, bright light switches and processing solutions. But test on the spot with all safelights on.

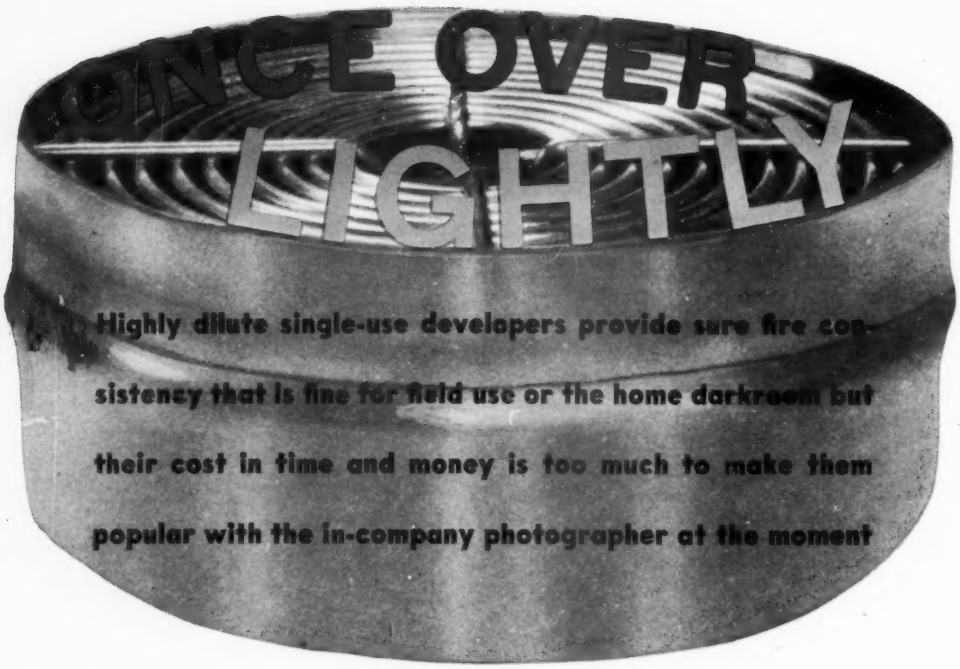
BRIGHT SPOT

Special bright light safelights in strategic locations provide sufficient illumination for special tasks without affecting general light level. Parts are slit, tube, filter, lamp.

ZONE LIGHTING



Zone lighting consists of safelight darkrooms, subdued yellow light for auxiliary areas. Bright enough for finishing tasks, yellow light preserves worker's dark adaptation.


ONCE OVER
LIGHTLY
Highly dilute single-use developers provide sure fire consistency that is fine for field use or the home darkroom but their cost in time and money is too much to make them popular with the in-company photographer at the moment

Single-use developers have come a long way since the MQ tube. This fragile glass cylinder with the corks at both ends was, for many, the initiation into the mysterious ways of photographic chemistry. Put out by virtually every manufacturer and an integral part of every introductory darkroom kit, it sold for about 5¢ and could develop one roll of No. 120 film or about twenty contact prints. The ultimate in unfussiness, the powders in the tubes were dissolved in a glass of drinking water, like a headache powder, or in a graduate, if you cared to get fancy.

Although these powders are still available, in metal wrap instead of glass, they are, save for emergency use, not part of the professional kit. This is not the case, however, with the current series of single-use developers. They enjoy a popularity and respect never aspired to by their country cousins. The reason is that the new developers combine the convenience and consistency of the MQ tube with the specialized quality offered by standard developers. Of the dozen single-use developers listed by manufacturers, seven are designed for specific film-exposure needs, ranging from the sharpness of X-22 to the high exposure indexes offered by Ethol T. Instead of looking for one standard developer for all films or storing several developers for special cases, the single-use developers offer fresh, specialized developer in convenient form with consistent results. There are no problems of shelf life, oxidation, replenishment. In use, the single-use developer is added to the proper quantity of water and the photographer is all set.

Limited for in-plant use

Despite the apparent advantages, these developers have not been too popular with most in-plant cameramen. Part of this unpopularity is due to cost. Depending upon the single-use developer selected, it can vary from about 4¢ to 15¢ per roll. By comparison, D-76 in the gallon size can cost as little as 2¢ a roll if it is replenished. Another factor is time needed to mix the single-use stuff. It is very convenient for the amateur or pro who processes only a few rolls at a time. In many industrial sections, the lab operation is more like photofinishing, with high-volume work done to tight time-motion study controls. It is far easier and faster to siphon off ready-mixed developer from an overhead storage tank than to mix a small amount of developer for every roll or two processed.

Finally, the industrial man does not always need the special quality built into these developers. Sharpness and fine grain are hardly pressing problems to the man who considers a 4 x 5 Graphic his miniature camera. Fresh developer? At the rate of use, a few sections have to mix a new batch of developer daily. Consistency? Quality-control methods and automated equipment take care of this aspect for another small minority of in-plant units. In short, they were not designed for the average in-plant man (if there be such a mythical animal) as they do not offer enough incentive to offer serious challenge to quantity developers; at least, not in the present state of the art.

Do industrial users ever employ single-use developers? Yes. One section head reported that he uses it in the field to check his results. "I usually develop a roll or two to see if the cameras work properly or if there are any major defects in equipment or materials. At the lab, we may use it occasionally if we have a special job. Most of the time, we find standard developers more than adequate."

Naturally, there are exceptions.

SINGLE USE DEVELOPERS

DEVELOPER (manufacturer)	RECOMMENDED USE & DEVELOPING TIME	DILUTION	UNIT COST (COST/OZ.)	EST. PROCESSING COST/ No. 120 RL
RODINAL (*Agfa*)	Highly diluted for slow and some med. speed films. Also for Isopan Record. Time of development 10-20 min. @ 70F according to contrast desired, degree of dilution, emulsion.	1:50 to 1:100	3 oz. $1.50; 16 oz. $3.95 *(25-50¢/oz.)*	4¢ to 9¢ per roll (based on 16 oz. of working sol. per No. 120 roll).
FG 7 (*Edwal*)	Dilutions vary from 1:1 for fast, fine-grain (4 min. @ 70F) to 1:15 for thin emulsion films. Development times from 4 min. to 12 min. according to emulsion, degree of dilution.	1:1 to 1:15	4 oz. 49¢; 16 oz. 99¢ *(larger sizes available)*	4¢ to 13¢ per roll depending on dilution, initial unit cost.
TEC (*Ethol*)	Compensating developer for thin emulsion films. Development times 7-11 min. @ 70F.	1:15	Three 1-oz. bottles, $1.	17¢ to 33¢ per roll. Each oz. can be used for two rolls.
X-22; X-44 (*FR*)	X-22 designed for thin-emulsion films. X-44 is for medium, high-speed films with rapid developing time, fine-grain. X-22 times @ 68F, 10-20 min. X-44 times @ 70F, 3-6 min.	1:10 to 1:20	Three 1-oz. bottles, 75¢ *(25¢/oz.)*	13¢ to 25¢ depending upon whether one or two rolls are processed in each ounce of concentrate.
D-76, DK-50, MICRODOL-X (*Kodak*)	Standard formulas which can be used at 1:1 or 1:3 dilutions for single-use developers. Dilute form gives higher acutance, lower contrast compared to use as standard developer. Developing times 7-15 min. @ 68F depending on film, agitation.	1:1 to 1:3	D-76, 90¢ per gallon; Microdol-X, $1.85/gal. DK-50, 60¢ per qt. *(.7¢ to 2¢ per oz.)*	D-76 1:1 is about 6¢ per roll. At 1:3, Microdol-X is about 8¢ per roll.
PERINAL (*Perutz*)	Highly concentrated developing agent for thin emulsion films. Compensating action. No longer imported at present. Developing times 9-15 min. @ 68F for 1:50, 17-19 min. at 1:100.	1:50 or 1:100	1/10 Liter (about 4 oz.), $1.50. 16-oz. size, $3.95. *(25¢ to 50¢ per oz.)*	4¢ to 9¢ per roll.
NEOFIN (*Tetenal*)	Highly concentrated for thin emulsion films. Neofin Blue for slow films. Neofin Red for faster films. Developing times vary. Normal is 12 min. @ 68F.	Concentrate to make 600 cc *(about 20 oz.) of developer*	Five ampules, $2.10	About 20¢ to 40¢ per roll. Each ampule can process two rolls.

These involve single-use modifications of two existing developers, D-76 and Microdol-X. Many sections are using these as one-time developers with small (No. 120 and 35mm) film sizes in the 40 to 200 E.I. range. Reports one cameraman: "We use Microdol-X diluted 1:3 for Plus-X Pan. Before this, we used D-76 diluted for Panatomic-X, but we switched to get the extra speed of Plus-X. We feel that the extra cost is offset by the consistency and quality gotten by using fresh developer every time." This Kodak-recommended modification of D-76 and Microdol-X was fairly wide-spread among the smaller sections queried. The work load is small enough so that the slight additional cost per film processed is not significant.

None of the manufacturers had specific recommendations for industrial uses of their single-use developers. They felt that as far as quality went—fine grain, speed of processing, effective emulsion speed, etc.—equal results were possible with their standard line of developers. There are no inherent advantages of single-use developers over standard formulas unless the developer itself is designed to meet a particular need.

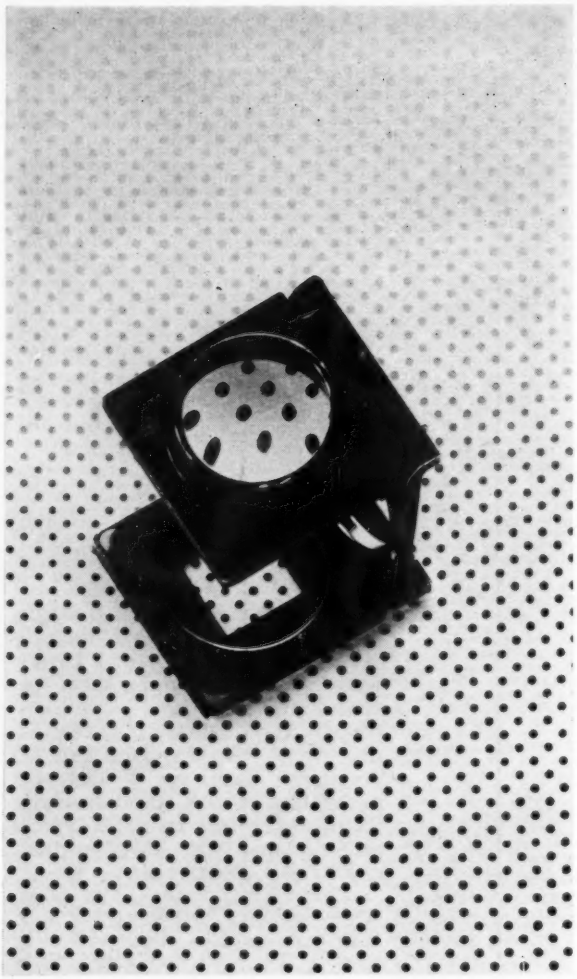
Need sparks revival

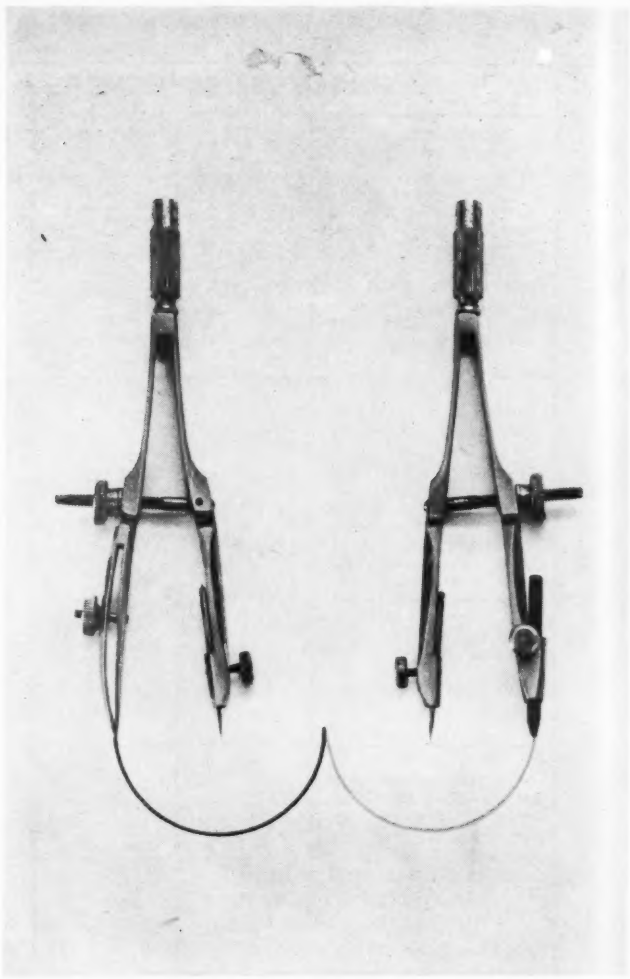
It was, in fact, the particular need of 35mm photographers that sparked the one-time developer revival. The need was for sharpness or acutance. Many fine-grain developers of the day (from 1935 to the present) depended on the silver solvent action for their fine grain effects. The grain was still there but it was fuzzy, indistinct and not as noticeable. The pictures were less sharp in terms of grain, but they had an overall smoothness which compared favorably with the pepper-and-salt results from the more conventional developers.

(This loss of sharpness from fine grain developers was mentioned in the literature from time to time, but it wasn't a problem as great as the grain question.)

The Germans, to be sure, kept on using non-fine-grain developers but they also insisted on using slow films which, to speed conscious Americans, wasn't quite cricket, to mix a metaphor. After all, ran the reasoning, why use an f/1.5 lens if you muddle along with a slow (about 16-24 E.I.) film. Since

(continued on page 66)





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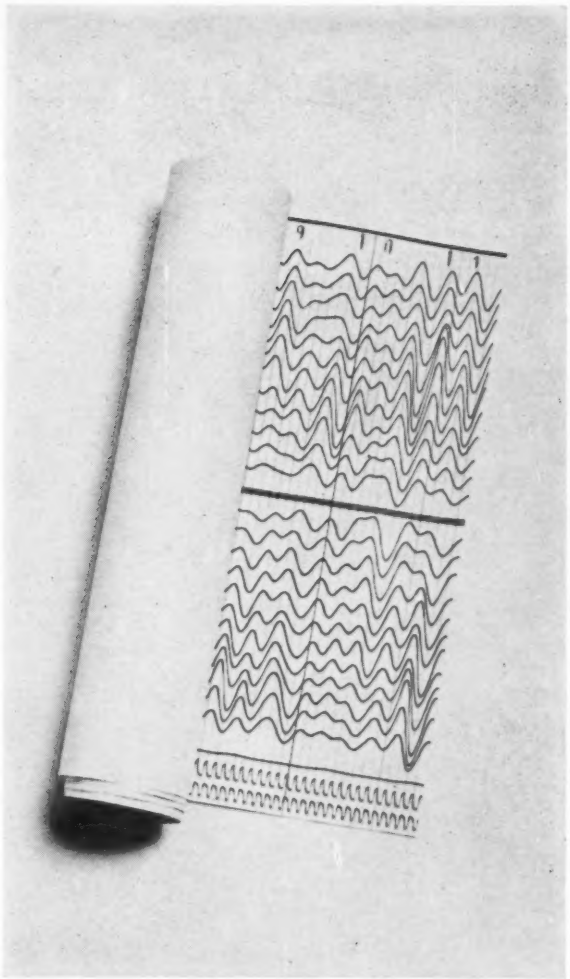

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Lino-Flex Photorecording Film

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Though he could pass for for a Wall Street banker, the man at the right is a member of the United Steelworkers of America. And that burly-looking shirt-sleeved individual below is a vice president

PORTFOLIO NO.28

of Inland Steel Corporation. The two represent opposing sides in a strike settlement that ended in the negotiation of a three-year labor contract.
These are rare pictures. Normally, labor negotia-

tions are off limits for photographers. More unusual yet is the fact that they appeared five years ago in an employee magazine, the excellent Inland News. *While most company publications limit coverage of labor conflict to management statements, or ignore the whole area in the apparent hope that it will go away*—News *Editor Jerome*

A. Schmitt plays it right down the middle. His objectivity is an outgrowth of company policy, stated by Inland's William G. Caples, vice president in charge of industrial and public relations—"We accept unions as an integral part of our way of life." The pictures demonstrate this attitude forcibly, and re-enforce the straight talk in the News. *Al-*

though the magazine has three capable staffers in Frank Comandella, Dick Linsenmann and Robert McCullough, the action took place out of town; it was assigned Bob Goodman of Black Star. It's all 35mm camera work.

gh,

HIGH-SPEED PROCESSING

Almost instantaneous processing to negative, print or transparency is seen by Edward K. Kaprelian, who reviews progress to date as presented in the Rapid Processing Symposium of the Society of Photographic Scientists and Engineers

It is probable that within the next five or ten years we will be able to process photographic materials in a fraction of a second, permitting a normal negative, print or transparency to be available to the photographer virtually instantaneously. The potential value of truly rapid access techniques to many users of photography in industry, business and the military is significant, and considerable research and development is now being directed toward solving the problems lying in the path to such a goal.

The extent to which this particular area occupies scientific and engineering talent is apparent in the fact that almost 500 persons attended the Rapid Processing Symposium held by the Society of Photographic Scientists and Engineers in Washington, D. C., on October 14 and 15, 1960. As might be expected, most of the contributed papers dealt with the materials, techniques, chemistry and equipment for silver halide systems. Xerography and Kalfax were also covered in other papers, and one new all dry photographic method was presented, as well.

Promises, no breakthrough

Although it cannot be said that any major breakthroughs were apparent, some promising original work and a number of worthwhile advances were reported. The program is reviewed here briefly and in its entirety, in the interest of PMI readers for whom rapid processing has current or expected application. Within a few years the descendants of these rapid processing systems will be enjoying general use; in the meantime it is possible that the contents of the papers will help solve current problems involving the photographic method.

The keynote was set at the first session with an invited paper on the Revolution In Photographic Processing by SPSE President George Eaton of Eastman Kodak Co. The four objectives of photographic processing he pointed out as being (1) quick, convenient availability of the processed image on film or paper (2) viewing of the image while still being processed (3) automatic precision processing and (4) achievement of image quality adequate for specific applications. He gave such current examples of progress toward these goals as office photocopies in less than 1 min.; developed images of oscilloscope traces in 4/5 sec.; dry, ready-to-read radiographs in 6½ min.; and the Polaroid Land camera. He acknowledged the progress achieved by methods not requiring chemical processes, such as thermographic and electrostatic recording, at the same time enumerating the potentials of the inherent advantages possessed by the silver halide systems.

Ansco's rapid processing commercial camera produces negative or positive.

Ansco's automation

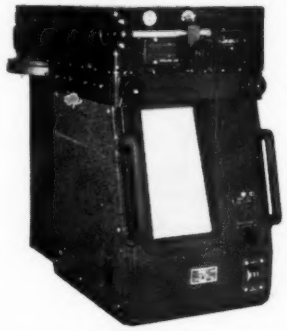
Ansco workers presented three papers which indicate the considerable extent to which this firm has become involved in rapid processing during the past four years. Mr. Arthur Nields considered the design of rapid access photographic recording equipment from the systems viewpoint, with every step, component, and interrelation included in the design parameters to assure overall performance. Achievement in connection with the recording of a strip map from a cathode-ray tube line scan included a developer which produced a negligible change in sensitometric characteristics of the film over a range of developing times from 5 sec. to 50 sec. and a film transport possessing motion uniformity within ±0.25 per cent and tracking accuracy within 0.0002 in. in 4 in. of film motion.

Zoltan Takats described in detail a camera-processor and viewer for 5-in. film initially designed for military application. The automation of all processing operations for either continuous or frame-by-frame treatment, and other design characteristics of the magazine type processor indicated the feasibility of its application to commercial, industrial and institutional needs. John Mertz described the evaluation of high speed cathode-ray tube recording films and rapid processing techniques which Ansco

made in determining the best approaches. The result is a new film-process combination which yields almost-normal quality processed film in 5 sec. of development and 1 sec. of fixing time. Through use of this arrested development technique reversal processing can be achieved in 30 sec.

35mm to 1 ft.

Robert Mason gave an account of the Rapidata Photo Processor of Photomechanisms, Inc., developed for presenting a side-looking radar display, but possessing potential for more general application. The porous applicator in this system forms a meniscus of developer such that only the meniscus and not the applicator touches the emulsion. Prehardened emulsions such as Ansco Hyscan and Kodak SO-264 are processed within 5 sec. at a temperature of 130°F using Kodak



Ansco unit with rapid processor: immediate display of 5-in. film.

Monobath PS-497. Film and paper widths from 35mm to 12 in. have been processed by this system.

In-flight processing

Chicago Aerial Industries' Jerome Goldhammer described the in-flight processing magazine for the KA-30 aerial camera. The CAI system employs a saturated web applicator using a combined developer-fixer to produce good negatives at processing rates up to 6 frames (2½ ft.) per sec. Kodak Aerecon Plus-X and du Pont 931 films are used and reasonable temperature tolerance and camera rate independence are achieved. The characteristics of the Rapromatic, Inc., 16mm and 35mm saturated web processors employing monobath chemistry were presented by Seymour Schreck. Maximum processing rates of 300 ft. per min. have been achieved, with access times as short as 1 second.

Rapid CRT recording

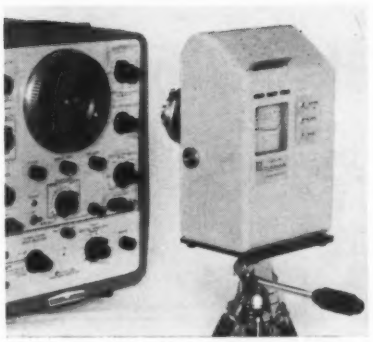
Two systems for rapid access oscillographic recording were described by J. H. Jacobs of the Bell & Howell Research Center. In the "Datarite" system the recording paper is exposed, a thin layer of developer is applied to its surface by a blade applicator, and the paper is run over a hot platen which accelerates development and then dries the paper. At the maximum paper transport rate of 25 in. per sec. access to the recorded image is achieved in less than 1 sec. Some equipment design modifications having a shortened paper path and provided with a transparent red window over the platen permit fast access even with much lower paper speeds. In the "Dataflash" system employing print-out paper latensification (intensification of the print-out image after exposure by exposure to light) is achieved without fogging of the background by first bringing the paper to a high temperature and then applying intense light to the emulsion surface. Access time of less than 1 sec. is achieved.

Lab in the film

Eastman Kodak Co. workers were authors of five contributed papers covering a variety of processes, materials and equipment. A new silver-sensitized oscilloscope-recording paper with self-contained chemicals for its development was described by W. B. Kendall, co-author with P. H. Stewart and W. Bornemann. The processor for the paper is a heating chamber entirely enclosed except for slits through which the exposed paper enters and the developed paper leaves.

Moisture normally contained in the emulsion and film base is driven out by the heat in the processor and condenses on the surface of the cooler, newly entering emulsion. The combination of moisture and heat results in development within a few seconds. The paper, known as K-1549 is usable only with oscillographs employing high-intensity mercury lamps; the prints retain legibility for months under conditions of 50 per cent humidity and can be made reasonably permanent by chemical processing.

Charles Kunz of Kodak's Apparatus and Optical Division described a roller transport processor



Photomechanisms, Inc. Model 414 Rapidata equipment and sample work.

and dryer capable of handling a variety of sensitized materials. Related in a general way to Kodak's X-Omat processor which produces developed and dried radiographs in 7 min., the new processor is more compact. It carries film through the developer, fixer, washer and hot air blast dryer on a system of rollers, the transport for which provides agitation in the processing tanks. Changes in transport speed provide operator compensation for varied development conditions.

Monos and complexes

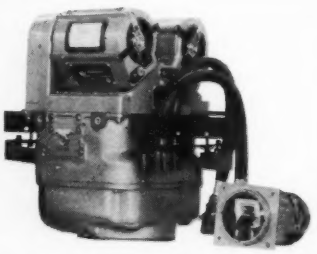
From Kodak's Research Laboratories came two study papers. The first, dealing with the mechanism of development in monobaths containing the thiosulfate ion, by J. C. Barnes, provides the basis for considering physical development as the means whereby development occurs in such developers, and for exploiting this concept in evolving improved monobath formulas. The second, by J. R. King, G. M. Haist and L. H. Bassage, was a study of six different classes of organic silver-complexing agents for photographic monobaths, and presented data on various characteristics of the image, on the temperature dependence of the developer agent

and the monobath temperature dependence as a whole.

Kodagraph wash-off contact film for rapidly processed industrial photographic applications was described by F. J. Drago, A. C. Smith and J. W. Parker of the Kodak Research Laboratories. It is a high contrast material for contrast printing of engineering drawings from negatives and can be handled in room light. Because part of the processing chemistry is incorporated in the emulsion, development can be achieved in less than 1 sec. by immersion in an alkali activator at elevated temperatures, and conventional fixing is not required. The Estar base is stable, tear resistant and non-curling.

Capillary chamber

A capillary chamber process was described by Karl-Heinz Lohse and M. Skolnik of the Aeronutronic Division of Ford Motor Co. This step processor develops, fixes, washes and dries single frames of 35mm black-and-white negative film in 5 sec. Minimum volumes of solution are needed to form the capillary layers and the process is not sensitive to gravity or attitude. The process, developed for use with a rapid-access display system, produces good image quality.



CAI's Integrated Reconnaissance Intelligence system result.

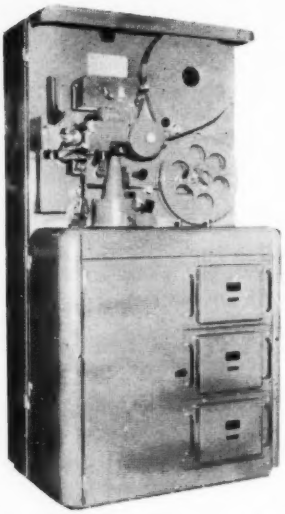
E. R. Townley of Kelvin and Hughes America Corp. assessed the characteristics of that firm's atomized jet spray applicator system which processes black-and-white film in 5 sec. The combination of vigorous processing at minimum temperature and use of fresh solution for each frame was offered as the basis for achieving uniform, long lived results. He commented on the suitability of various developers and fixers for jet spray use, and described a high-speed method for processing to a positive.

Where do we go from here?

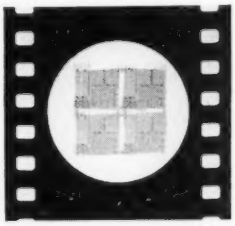
An invited paper on the future military and commercial applications of short access time photography was presented by E. K. Kaprelian, Deputy Director of Research for the Signal Corps Research and Development Laboratories. He predicted that immediate access (1 sec. to 1/10 sec. or less) photography producing negatives, prints or transparencies indistinguishable from normally processed items probably would be achieved within 10 years. Applications include improving side looking radar and optical correlation radar real time telemetering of data from manned and unmanned aircraft and satellites, office photocopying, medical and dental long distance diagnosis via facsimile, crime detection and law enforcement and sporting events coverage. He stated that failure to achieve the goal of immediate development of photographic images would eventually result in surrender of the rapid access uses of photography to such non-photographic methods as thermoplastic tape recording and magnetic recording.

Continuous tone xerography

J. T. Bickmore of Haloid-Xerox, Inc., and A. H. Ett of Philco Corp. described an experimental xerographic device for displaying and recording continuous tone information with very short delay. Line scan signals on a high resolution cathode-ray tube are focused on the surface of a charged rotating xerographic drum where the resulting electrostatic image is developed, and the visible image is transferred to a paper web. Inherent resolution of the processor is 14 lines/mm and the image density range is 1.5. The development and transfer stations each occupy 1¾ in. of the drum's periphery; at the 0.3 in./sec maximum peripheral travel each step requires 5 sec. The drum rate is continuously variable from 0.3 in./sec to 0.03 in./sec.



Kelvin & Hughes America Corp. processor/projector and sample.



Episcopic-ology

Another paper by G. R. Mott, H. E. Clark and J. Dessauer of Haloid-Xerox showed some modifications of that company's PROXI (projection by reflection optics of xerographic images) method. This is the arrangement in which the image from a cathode-ray tube is received on the selenium surface of the xerographic plate, developed with charged powder, and the developed image immediately projected onto a screen.

The episcopic or magic lantern type of projection which the system uses is quite efficient because of the specular reflection characteristics of the selenium surface. The optical system comprises, in order, a lamp condenser, the developed plate which behaves as a mirror (and incidentally acts to fold the optics) and the projection lens. The authors propose to improve the already favorable light transmitting

characteristics of the system still further so as to permit filling very large screens by (1) transferring the powder image to a transparent base for normal projection or (2) to a metallic mirror surface for episcopic projection of maximum efficiency. PROXI is applicable to many of the usual rapid display uses and in addition is proposed for air traffic control, and for access to large libraries and files by combining PROXI with closed circuit television or a scanning tube.

State of the art

The present state of the art in rapid processing was reviewed by S. Hersh and F. Smith of the U. S. Army Signal Research and Development Laboratory. Rapid processing systems were systematically classified as to direct or indirect application, fluid viscosity, and applicator structure or technique, and representative examples of equipment in the various classes were discussed. Different approaches for achieving rapid access results having military interest were presented, including experimental designs originating in the Signal Corps. The difficulty of comparing various rapid-access methods because of the differences in emulsion types exposure, effective emulsion speed, image characteristics and readout characteristics possessed by each method was pointed out.

J. Schantz of the U. S. Naval Photographic Center traced the Navy's need for rapid processing from its early experimentation to the current Navy processors. Features and performance characteristics of different Navy rapid processors, including self-contained, portable machines were described.

R. Sprague, co-author with E. Wainer and H. Fichter of Horizons, Inc., described a new dry photographic process which yields a direct print-out dye image. The process, sensitive in the near ultraviolet, is 20 times faster than diazo, but considerably slower than low speed contact paper. It relies on the reaction of the free radicals produced in carbon tetrabromide during exposure with arylamines. The reaction forms a blue dye image which is fixed by simple heating. The image has good continuous tone, high resolution and is grainless in the ordinary sense.

Some further data and a new application of the Kalvar process were presented by W. F. Elbrecht of the Kalvar Corp. Characteristics of this high resolution material which has its maximum sensitivity at 3850 Angstrom units in the ultraviolet region were reviewed. The effect of various light sources on exposure, the effect of storage on the material, and application to high-density information storage were discussed. A new rapid display application for the Kalvar process is in combination with the Printapix tube, an electrostatic printing tube, which places a powder image on the surface of the Kalvar material, which is then exposed to ultraviolet, the powder removed from the Kalvar surface and the latent image in the Kalvar developed in the normal manner for this material.

Itek's acuity

Itek Corp. personnel presented two papers concerned with the problems of high image acuity in rapid processing system. M. Wright, R. Polk and P. Fedelchak considered the problems involved in selecting the film and process for producing on a single sheet of film both high resolution continuous-line photography and digital data.

In achieving their goal of a dry-to-dry processing time of 30 sec. with low fog, maximum density of 2.3, gamma of 1.5 and good uniformity they utilized Kodak experimental film 57-1, an extremely fine grain emulsion similar to that in Kodak 649 plates but six times faster. Resolution realized was greater than 100 lines/mm. The experimental equipment designed for utilizing the process was described in the second paper by M. Wright, E. Thompson and I. Spiegel. It uses 3 x 4-in. film which is held in a vacuum chuck within a processing chamber. The emulsion side only is exposed in succession to thin, high velocity sheets of developer, rinse, fixer and wash water which are as wide as the film, and finally with a similarly shaped stream of dry air. The solenoid valves regulating the flow are controlled by a programmer accurate to 1/10 sec., and temperature control is within 0.3° F.

Haloid's PROXI, Projection by Reflection Optics of Xerographic Images.

A Phenidone-metol monobath evolved at NHK Technical Research Laboratories of Tokyo was described by Dr. Y. Wakabayashi who read the paper in place of the author, Shoku Ohashi. Used in the system for relaying the program of the Olympic Games from Rome to Tokyo via television relay on short wave, it achieves development in 2 min. at 86° F yielding a gamma of 0.7. The developer is relatively temperature-insensitive with regard to density difference. A compact processor designed for use with the developer produces a processed image ready for transmission within 5 min. after exposure. The film speed, gamma and uniformity of development are relatively independent of film drive speed, temperature or agitation.

The symposium closed with a summary of its highlights by H. K. Howell of Itek Corp. Exhibitors showing rapid access equipment were Ansco, Chicago Aerial Industries, Haloid, Kelvin and Hughes, Photomechanisms, Inc., and the Naval Photographic Center. A *Short Annotated Bibliography on Rapid Processing*, a comprehensive bibliography prepared by Elsie Garvin of Eastman Kodak Co. and distributed by that organization, was a welcome bonus to those attending the symposium.

In summary it can be said that the program revealed:

1. Nothing that would have a direct or immediate effect on standard processing of color films **2.** Some processing chemistry and some processing equipment which either now or in the immediate future can reduce the time required in the standard processing of black-and-white films **3.** Some chemistry and some equipment which give very short access time for specific applications through the use of special, hardened emulsions and high temperature processing **4.** Some promising developments for general-use rapid processing of the future.—THE END

MEMO ON:

THE PRINTER'S DILEMMA...

No matter how good he may be, the darkroom printer is still the low man on industry's photographic totem pole

The position of the photographic printer in industry might be compared with the position of a crew chief in the Air Force. A good man is hard to find, worth his weight in all sorts of valuable bric-a-brac, requires training and experience. But in the final analysis, it's the pilot who gets the glory. In the case of the in-plant section, the pilot's position is occupied by the cameraman. Not only does he have a relatively higher position but in most cases, the switch from enlarger to camera is a promotion, the first step to supervisory responsibility.

The photographic pecking order starts, for the most part, with a darkroom helper at the bottom who sweeps the floors, washes the bottles, may wash and dry prints. The next step is the darkroom technician. If there are several, the contact printing is handled by a lower-ranking man than enlarging. In some sections, these jobs are rotated so that the rank differentiation would not apply. In the larger sections, there may be two classes of darkroom technician, the highly-skilled who handle problem assignments and the less-skilled who may do routine work. At this level, the problem of what to do about a good man occurs. In very few sections, there is a lab chief who supervises the darkroom. In most sections, however, the normal promotion is to cameraman.

Every man to his last

In some cases, however, the darkroom man may be better suited for lab work than for outside assignments. One case listed a darkroom man who refused promotion to cameraman. Several section managers commented that quite often, the result of promotion was to lose a good darkroom man and gain a mediocre cameraman. One remedy suggested was to increase the possible maximum salary for darkroom people as compared to photographers.

Part of the salary problem, however, lies with the personnel people who calculate wage scales on the basis of judgment and/or responsibility. There is, naturally, a wider area of independent activity and discretion in the role of the cameraman. Not only is he technically responsible for his work but he must be able to direct people and be able to go anywhere. It is a job which requires considerable tact and personality. Contrasted to this, the printer in his lab is merely technically responsible: his job is to turn out a satisfactory print. The judgment involved covers only the best way to achieve this purpose, not the basic method itself. In industry, technical competence is rewarded, but only to a point. The greater rewards go to the decision-makers, which, considering that they establish the wage pattern, seems a natural state of affairs.

Areas of decision

What areas of decision are left to the printer? This varies, in general being inversely proportional to the size of the lab. In smaller sections, the darkroom man may decide for himself what paper and chemicals he needs. In larger ones, the lab chief or the manager of the section may make the final decision. Quite often, the darkroom technician may suggest a material for possible use. One section head said that they would run tests on such materials and, if the results were good enough, make the necessary changes. However, the basic procedures are too well-established for the desired quality. A change would require extensive testing.

The final solution is almost always a compromise between production capability and maximum quality. In all cases, the customer (management) must be satisfied. However, they cannot expect to get custom-lab quality at mass-production prices. The question of quality is the question of educating management to what good pictures are and how they can be obtained. Probably every photo manager has complained, at one time or another, that management asks the impossible, expecting superior work from inferior tools.

The tools to do the job

By and large, however, most sections have good basic equipment for the printer to work with. A typical industrial darkroom enlarging post includes a 4 *x* 5 enlarger (Omega, Beseler or Durst) with a standard Tessar-type enlarging lens. Foot switches and automatic timers are standard for both enlargers and contact printers. Printing meters, electronic enlarging equipment and the other automatic devices are generally not used in black-and-white work. The feeling seems to be that a good printer can determine contrast, exposure and required dodging by himself, using,

perhaps, a test strip or two.

A few departments, however, are using more refined techniques, notably the electronic printing meter with on-easel probes. The number of converts seem to be small but growing. Both increased production and better quality are cited as points in favor of these recent scientific aids.

Color is a somewhat different story. Because of the higher expense and more volatile temperament of color materials as compared to black-and-white, sections doing color work generally have some type of objective exposure and filter determination, such as a densitometer or enlarging meter as necessary equipment.

The work load in most sections is not heavy enough nor varied enough to warrant the expense of extremely elaborate automatic equipment such as might be found in service labs or photo finishing plants. While the printer is expected to get the best possible print from a negative, photographers are expected to produce reasonably good negatives which are fairly easy to print. An occasional goof or adverse environment is expected: if this becomes too common, the cameraman often finds himself out of business.

For the most part, negatives are not developed by the cameraman where the department is large enough for a division of labor between cameraman and darkroom workers. In virtually all cases, the negatives are never printed by the cameraman. The only connection between the photographer and his negatives might be some scribbled notes on the exposure index or the type of lighting used.

Print sizes and quantities are determined by the work order. This work order is supplied by the customer or the responsible photo manager. How the printer fills the order is up to him, provided he uses the material available.

Production expected from the average printer varies. All managers make allowances for the quality of negatives and the size of the print order. It is easy to print 200 8 x 10s a day from several 20-prints-from-each-negative orders. It is less easy to turn out a good 16 x 20 from a Rollei negative. However, production per man should be within the 100-200 print per day range. The work load is seldom so heavy in industrial sections that the emphasis is on quantity rather than quality. In general, the most important criterion is quality: efficiency comes with experience.

If formal training is uneven for cameramen, it is even more so for printers. Without exception, printing is considered a job requiring a fair amount of on-the-job training, some judgment and talent and a great deal of experience. Most photo managers felt that a man should develop into a competent printer within six months to a year. One manager felt that this was on the long side and that if a man couldn't learn to be a good printer in six months at the most, he would never make the grade.

The quality of the lab work is determined by the judgment of the manager or lab chief. If the work turned out by the printer is not up to standard, it is rejected. A few of the larger sections promote an expert technician to a quality control post. Typically he inspects every job, comparing the quality of the print to the negative with the aid of a light box. The majority of equally-large sections however rely on catch-as-catch-can inspection by the department chief. These standards are fairly rigid although not completely inflexible. Prints for the file are not required to be as good as prints for the president's office, although the quality gap had better not be too great.

Quality vs. cost

Quality costs money in time, materials and salaries. While few sections place restrictions on the amount of material used, most managers prefer to keep spoilage as small as possible, within 10 per cent. One plant has a 5 per cent record which is somewhat better than the industrial average.

As for salaries, this is in the same security classification as atomic bombs. From the meager information available, the range for printers in industry is from $65 to $100 weekly. Darkroom supervisors and the senior printers in larger sections receive a little more. This is lower than the range of pay for cameraman, about $75 to $150 weekly. The pay scales, of course, vary considerably with size of the section, industry and geographic area. One photo manager remarked that he was "amazed" at the comparatively high pay, $100 to $130 a week, for printers in New York commercial houses. In custom labs, of course, the pay is even higher. In some cases, the printers make more than their photographer-customers.—END

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For the convenience of its readers, PMI has prepared this index to the articles which have appeared on its pages during 1960. We regret that individual back issues of PMI are not available. However, issues of PMI for the full year of 1960 are available on 35mm unperforated positive microfilm for $10. A 10X Taylor Viewer will be included in your order at no additional charge. (Issues for 1958 and 1959 are available on the same basis.) All orders are sent postpaid, Continental United States. Write to PMI MICROFILM SERVICE 33 W. 60th Street New York 23, N. Y.

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• Look at work of other film makers		Oct.	20
• Photography's the same, but stills and movies differ		Nov.	22

Photographic Administration

Title and/or Subject	Author	Month	Pg.
ALLIS-CHALMERS MFG.		Sept.	30
ARKANSAS FUEL CORP. Ex-engineer and staff make pictures in hospital-neat photo lab		Nov.	28
CAPITOL RECORDS, INC. Shooting album covers		Jan.	38
COLGATE-PALMOLIVE CO. Finds research efforts need assist from in-plant photo units		July	34
Cost accounting		Jan.	44
DOUGLAS AIRCRAFT CO. Crack unit scores on sales, P. R., documentations, instrumentation	Ernest E. Reshovsky	Oct.	52
FILM REPORT Defense contractors brief Uncle Sam with film reports	Philip Geraci	Oct.	42
FORD MOTOR CO. Dearborn motion picture unit competes with outsiders for company films		Sept.	36
Hiring		Feb.	42
INTEGRATED A-V Armstrong Cork Co. integrates staff and techniques		July	49
Inventory—simple system cuts waste while avoiding shortages		June	41
Leasing — Photo units can acquire capital equipment and stay within budget		July	37
Leasing—It still costs money		Aug.	47
Money—Facts on salaries		Apr.	57
PHOTO MANAGERS' HEADACHES		Oct.	51
Repro and photo: one section or two?		Nov.	31
SHELL DEVELOPMENT CO. Sophisticated photo staff works wonders for Shell Development braintrust		June.	34
Should industry maintain competing labs?		Sept.	35
Training		Mar.	55
• WORKING PHOTOGRAPHER Incentives	David B. Eisendrath, Jr.	Mar.	14
• Selling photo service to management		Aug.	16
• Industrial Photo Conference		Sept.	12
• Telling and selling photographic service		Nov.	16

Photographic Technology

Title and/or Subject	Author	Month	Pg.
ASSEMBLY LINE COPYING Control and contraptions make fine copies at low cost		Aug.	40
AUTOMATION IN THE INDUSTRIAL DARKROOM		Aug.	26
CASE FOR THE CONTACT PRINT Photography's oldest printing technique still holds edge for quality	Peter Jowise	Aug.	44
CATERPILLAR TRACTOR Co. Machines make the pictures		Aug.	30
DENSITY A definition of photographic optical density	Lloyd E. Varden	Mar.	34
GRAIN Cause and cure	H. J. Walls	Jan.	46
HIGHER AND HIGHER AND HIGHER New ASA methods for determining speed of photographic negative materials		June	73
MECHANIZED RUSH Automation helps channel UPI's daily avalanche of prints		Aug.	36
NEWEST FRONTIER Photography explores the ocean depths	H. Edgerton & S. Raymond	Sept.	48
ONE-MAN AUTOMATION G.E.'s Hanford operation cuts report print costs with roll processing		Aug.	42
PRINTER'S PRINTER The expert's expert prints the tough and terrific negatives		Feb.	48
RANGE PHOTOGRAPHY at Cape Canaveral		Dec.	32
SLIDEMAKING METHODS Simple system for slide duplication	George Ward	Nov.	32
STANDARDS Photoscientists set the ground rules for Canaveral photography		Dec.	48
STILL LAB Canaveral outfit collects its wits for plunge into automatic processing		Dec.	50
THE PUSH Photography with a minimum exposure		Mar.	52
TPR A new recording system circumvents sensitized material	Lloyd E. Varden	Feb.	34
WHAT'S WRONG WITH SCIENTIFIC PHOTOGRAPHY? Individualist calls for collective action to better American scientific photographers	John Waddell	Sept.	46
Why fluorescents are so tricky to use in photography	Willard Allphin	Sept.	41
• PHOTO METHODS FOR TOMORROW New black-and-white film speed standard to double exposure index, ease calculation	Lloyd E. Varden	Jan.	12
• Visits to film manufacturers show technological advancements		June	12
• Columbia's proposed course in photographic science		Aug.	70
• Formulary for color processing; high-resolution x-ray microscopy		Oct.	14
• Report on opening of Haloid Xerox Research and Engineering center		Nov.	12
• WORKING PHOTOGRAPHER Some comments on static	David B. Eisendrath, Jr.	Jan.	21
• Comments on static —II		Feb.	38
• Tripping cameras from afar		Apr.	16
• Time delays for automatic triggering		May	14
• Comments on techniques; idea exchange at PPA forum		June	16
• Methods, techniques, tricks of the trade		July	18
• Exposure meters; developments may shake a lag		Dec.	16
Water and its effect on photography	Howard Hall	Nov.	43

Reportage & Illustration

Title and/or Subject	Author	Month	Pg.
ANGUTI AT LARGE Socony-Mobil man covers the country		Apr.	52
CAPITOL RECORDS, INC. Shooting album covers		Jan.	38
CLOSE SHAVE Torkel Korling proves pictures are made in the photo lab		Feb.	52
CONSTRUCTION CHEESECAKE Architectural photography	Lou Jacobs, Jr.	July	38
G. E. PRINTED CIRCUIT LAYOUT INNOVATION		Feb.	54
House-Organ Photography—Portfolio No. 24		July	43
PRODUCT PICTURES Richard N. Wolf brings them to life		May	30
PROMOTIONWISE, THEY'RE CLICKING Adman salutes photos after running them up flagpole	Richard J. Margolis	Jan.	58

Monthly columns, preceded by a dot, are listed chronologically at the end of each category.

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WEST IS WEST

One of the more pleasant, albeit hectic duties to which PMI types fall heir is covering the many conventions, seminars, short courses, congresses and other gatherings which mark our fast-growing field. This month, the calendar pointed to Washington and a pair of high-speed events, a Processing Symposium sponsored by SPSE at the Shoreham, October 14 and 15, and the Fifth International Congress on high-speed photography, sponsored by SMPTE at the Sheraton-Park, October 16-22.

Since the events were planned without regard to PMI's production schedule, which calls for us to be going to press about now, this report is a series of "first impressions" dashed off in the SMPTE Press Room between papers. Like many first impressions, this may be slightly out of the ball park but as intrepid journalists of the old, or tear-out-the-front-page school, we are not afraid of recording our impressions, be they first, last or none at all.

The meetings were held concurrently in hotels across the street from each other and with many high-speed types at both sessions. The SMPTE affair was larger and we will devote most of our space to this, but rest assured, SPSE'ers, that this in no way indicates any lack of affection for your group.

The papers represented a true-cross-section of progress in High Speed Photography, ranging from such straight-forward (to we slow speed characters, that is) topics as *Focal Plane Shutters and the Design of High-Frame Rate Cameras* (Sigmund Jacobs, U S Naval Ordnance Laboratory, White Oak) to *Application of High Speed Photography in Nuclear Reactor Development* (Giroux and Lindholm, Argonne National Laboratory, Chicago, Illinois).

Over 1000 people registered for the Congress from the United States, France, Germany, Japan, Sweden, USSR, Australia, India, Netherlands, etc. It was a true meeting of scientific minds from all over the world.

In addition to the papers, new and choice hardware were displayed. Wollensak showed a new 20-60mm

(*continued on following page*)

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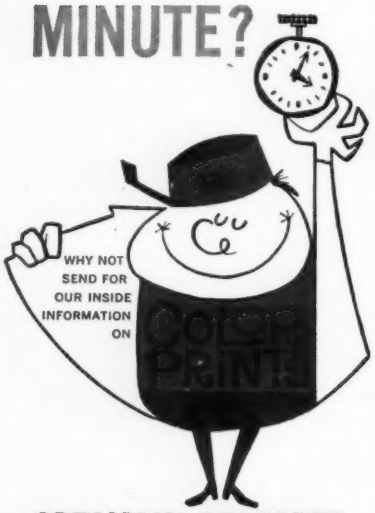

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Get more information. Circle 475, page 75

WEST IS WEST

(*continued from preceding page*)

Zoom f/1.8 in either C-mount or Fastex mount which they say is about equal in optical quality to standard, non-zooming lenses. Ansco showed their Microdensitometer and a rapid processor for 16mm film, plus a 9 x 9-in. rapid processing view camera. This display, incidentally, was moved from the Shoreham.

Another transfer was Kelvin and Hughes Rapid Processor, an English product which is just beginning to compete in the American market.

High-speed cameras were shown by Beckman & Whitley, Benson-Lehner, Fairchild, Flight Research, D. B. Milliken, Photosonics, Traid and Wollensak. Avco showed rotating mirror, Kerr cell and rotating drum cameras. Carl Zeiss displayed their new inferometer while another German firm, Frank Frungel of Hamburg, showed the most unusual attraction at the show, a high-speed spark camera. Called the Strobokin, the camera produces a series of spark pictures of an object in an ionized wind tunnel. The result is similar to schlieren, showing air flow and giving some idea of relative force by the size of the spark.

The general impression of many observers, however, was that the equipment shown represented improvements and developments of existing models, rather than any radical approach to the field of high speed. Considering that a fair amount of sophistication in design already exists, this is not a serious indictment.

As we said, these are first impressions of a very crowded and eventful show. We met a lot of people who, until these shows provide an opportunity to get together, are just names on a subscription list. Before we go, however, a vote of thanks goes to the hard-working PR people, Christopher Hyde for SPSE and Barbara Skeeter of SMPTE. A boy's best friend may be his mother but when it comes to SMPTE, it is the redoubtable Miss Skeeter.

All in all, it was hectic but we enjoyed it. Now if we can catch up on our other work and get the magazine out on time. . . .

Last minute notes

The Annual Dinner of the Industrial Photographers Association of America will be January 26 at the Friar Tuck Inn, Cedar Grove, N.J. For tickets and other last minute details, contact the IPAA at Essex House, 1050 Broad St., Newark, N.J. All in-plant photo people are in-

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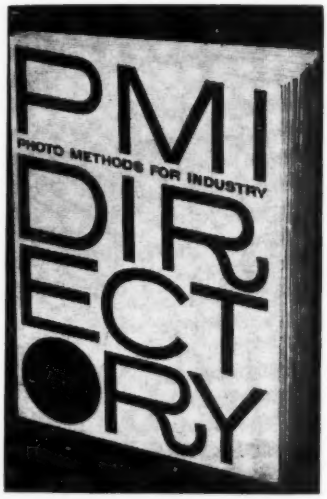

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vited to join the group, one of the livest wires in the photographic circuit. Martin Shemanski is president. Incidentally, congratulations are in order for Jack Carrar, Supervisor of Photography at Esso Research Center, Linden, N.J., for his extremely well-written and informative article for the company house organ on the uses of photography. Its role is summed up by this quote from Dick Sage of the Products Research New Uses Section: "The photographic techniques developed . . . make possible the study of problems once classed as impossible."

Philadelphia's Poor Richard Club, a group of (we hope) prosperous ad-game types, announces that William S. Vaughn, President of Eastman Kodak, will receive its gold medal of achievement about the time this magazine arrives in your mailbox (January 17, 1961). Vaughn, a Phi Beta Kappa and former Rhodes Scholar, has been with Kodak since 1928. He became President of the company in May 1960. We are pleased about the whole thing, not only because of the honor and the company but also because it helps prove one of our pet theories, that it takes as much brains to succeed in business as in the arts or professions.

Another award to a Kodakman is announced by the Biological Photographic Association. H. Lou Gibson, Eastman medical sales division, receives the Louis Schmidt Award. Gibson was cited for three special contributions to the field: developing formulas for photomacrography, lighting for photographing medical patients and research in infra-red medical photography. He is a former president of BPA.

A less personal honor went to George W. Colburn Laboratory, Chicago, from the Industrial Management Society for the part the lab played in the Society's annual motion picture competition.

The Diplome De Merite Exceptionnel of the Antwerp Film Festival went to Vogue Film Productions, Louisville, Ky. The honor went for its production of *Welding Aluminum —Different, Not Difficult* made for Reynolds Metals. The competition included 450 films from 30 countries. 38 films won this award.

There is an $825 scholarship to RIT's School of Photography waiting for a lucky (and deserving) cameraman-to-be. Offered by PSA, it is open to any recent high-school graduate who can meet RIT's admission requirements. Evidence of photographic interest and ability is required. Write PSA Scholarship, 2112 Inchcliff Rd., Columbus, Ohio.

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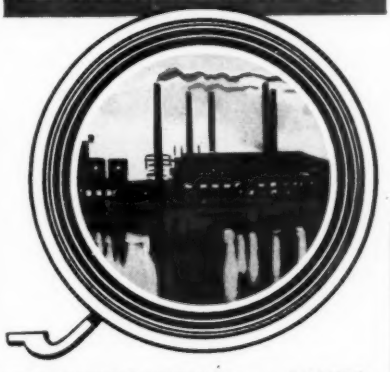

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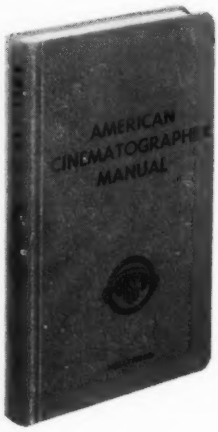

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Reportage & Illustration

Title and/ or Subject	Author	Month Pg.
SLOW ROLL Lockheeds Eric Miller shoots films in supersonic fighter		Aug. 38
• PORTFOLIO NO. 19 Photographic library at Standard Oil Co. (N.J.)		Jan. 52
• NO. 20 Chase Manhattan banks on an outstanding photographer		Feb. 44
• NO. 21 Pictures: piquant, pathetic and persuasive for WHO		Mar. 48
• NO. 22 du Pont tackles tricky research shots in color		May 42
• No. 23 Design and human values dominate work of John Evans, Pittsburgh Group Companies		June 42
• NO. 24 Alcoa editor-photographer, Charles Taylor, shows what can be done within confines of a modest house organ		July 42
• NO. 25 Flip Schulke thinks industrial shots are a lost cause without art		Sept. 36
• NO. 26 Ken Kollenberg, steel shooting man for Bethlehem Steel Corp., likes his pictures crisp and composed		Nov. 36
• NO. 27 Beauty in the terrible force of missile thrust		Dec. 40

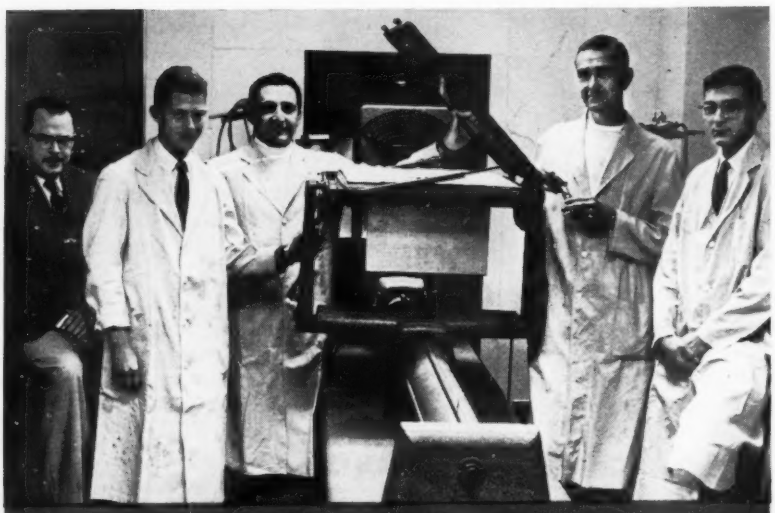
Reproduction, Graphic Arts & Microreproduction

Title and/ or Subject	Author	Month Pg.
BENDIX CORP. Engineering repro department dishes out huge volume in a hurry		Nov. II-32
BY THE NUMBERS Socony-Mobil has office duplication down to a system		May 57
CARD AT A TIME Three automatic process cameras slash labor and costs of listing and directories		July 64
ENGINEERING DATA PROCESSING Why the engineering document resists mechanization efforts	L. Schulz	
FAST WORK ON SHORT RUNS Allis-Chalmers slices time and costs with camera mask technique	Arthur Even	Nov. II-14 June 48
FEEDING FOSDIC Machine reads microfilm to compile national census		Mar. 38
GUIDING LIGHT 1/100 size images guide cutting torch in shipyard		Mar. 42
INDEFATIGABLE MICRO CAMERA Sets up photographs, stacks automatically	George E. Toles	Mar. 40
MICROFILM IN SUBURBIA Microfilm is pitched against the population exposition in Nassau County, N. Y.		Nov. II-24
MICROFILM IN THE DEFENSE PROGRAM Plans, standards, conferences hint at billion-dollar changes		Mar. 41
New document reproduction technique	Lloyd E. Varden	July 14
NON-PERSPECTIVE CAMERA Procter & Gamble camera squares up the viewer for better photo drawings		Sept. 52
OFFSETTING WORLD TENSIONS UN plant puts out up to one million pieces per day		Mar. 59
P. C. TARGET Lockheed man pushes standardization	J. K. Cornell	Apr. 75
PHOTO CIRCUITS Printed circuit specialists tell some of their secrets		Nov. II-40
PHOTONEERING New engineering drawing idea		June 54
PLATEMAKING SHORTCUTS Lockheed gives better, cheaper service with a well-conceived plan	J. K. Cornell	Nov. II-30
PMI GOES TO A PARTY Visual Communications Congress in Chicago		Nov. II-8
QUICK COPIES 3½¢ EACH IBM uses diazo for multiple copies of photographs quick, cheap and neat		Nov. II-38
REPRODUCTION Scientific paper work at Canaveral calls for short run specialists		Dec. 56
SELLING THE BROOKLYN BRIDGE Art and reproduction combine to make outstanding sales aid	Fred Frater	Nov. II-36
SIMPLIFIED OFFSET COLOR The simplification is a result of complex standardization	Peter Jowise	Nov. II-20
SPEAKING OF PICTURES Continuous tone microfilm eases **Life's** picture-filling problems		Oct. 66
SWITCH IN TIME Microfilm for Cutler-Hammer Engineers	J. E. Jones	Mar. 46
TESTING FILM BASE STABILITY Army map service goes to great lengths to determine length of film	Michael Geary	Nov. II-52
ULTRA-VIOLET LIGHT FOR PHOTOENGRAVING Black light is faster, cleaner in P.C. work	W. R. Bruce	Apr. 74
WEAK LINKS New demonstration lab points to efficiency through controls		June 50
X-RAY DIAZO COPIES New diazo films simplify radiographic duplicating	W. M. Whitehouse, F. Anderegg, F. J. Hodges	Aug. 48
• REPRODUCTION & GRAPHIC ARTS How to choose and use a lighting system for in-plant reproduction	Herbert P. Paschel	Jan. 24
• Questions and answers on topics of interest		Feb. 26
• Cure for difficulties posed by rosy rings		Mar. 63
• Ways to dupe an 8½ x 11 drawing		Apr. 76
• Keep the lens clean		May 60
• Developer in rolls; Newtonian neutralizer film becomes offset plate		June 60
• New color film for correcting pictures		July 66
• Color theory		Aug. 54
• Electronic flash in reproduction		Sept. 56
• Theory of line and halftone for photo men		Oct. 68
• Maintenance pays off: here's where to look for trouble		Nov. II-12
• Business show displays few new units		Dec. 26
• MICROREPRODUCTION Vatican film library and special facilities housed at St. Louis U.	Vernon D. Tate	Feb. 21
• Preview of the 1960 convention of the National Microfilm Assotion		Mar. 44
• Economics, technology and techniques of microfilm		Apr. 82
• Small print looms large for writer and user		May 62
• National Microfilm Association's 9th Convention is its largest		June 58
• New military specifications: a giant, hesitation step forward		July 70
• Literature of Microreproduction		Aug. 52
• NBS microscopy resolution test chart		Sept. 61
• Quality standards for microreproduction of text and line		Oct. 72
• Quality standard, Part III: Nelson Contrast-Resolution Index		Nov. 11-18
• Rubbery checks snap back at passer with microfilm on job		Dec. 22
• MANAGER'S VIEWPOINT The tech report: a juggling act with celerity, economy, quality	J. B. Cooper & R. E. Goode	Nov. II-10

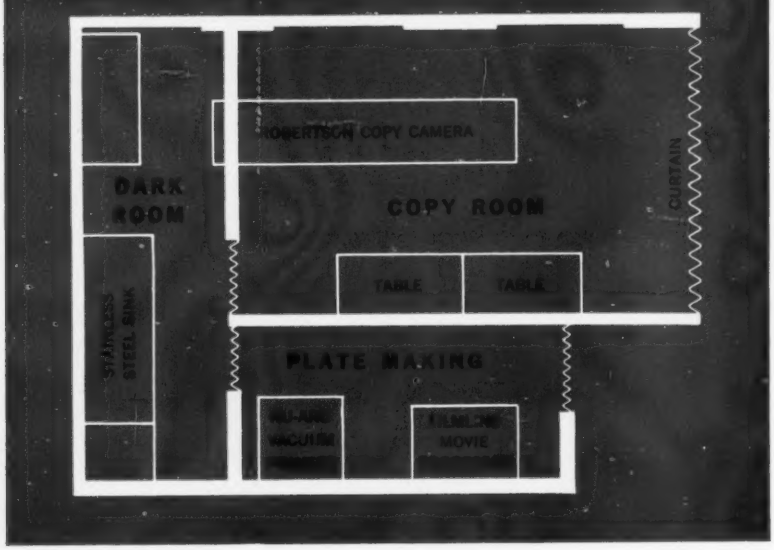
Although items may appear on more than one page, only the first page of the article is listed above.

ROCKEFELLER INSTITUTE

One of the oldest medical research photo sections in the country looks forward and comes up with new services that rate management approval



Members of the Illustration Service grouped around the Robertson process camera are (*left to right*): Richard F. Carter (Supervisor), Ken Lonky, Henrik Boudakian, Joe Crenshaw and David Ronsheim.



People will beat a path to a better mousetrap but they will not make it for you; you must make the mousetrap yourself. This bit of homespun wisdom is particularly applicable to in-plant photo sections. If they want to expand, they must offer more and better service to management and management will use them. However, it is up to the section chief to figure out the better mousetrap to bring management ringing at the section door.

This is what Richard F. Carter, Supervisor of The Rockefeller Institute's Illustration Service did when he started making offset plates a little over two years ago. The equipment was, to coin a phrase, improvised, consisting of an old 11 x 14 printing frame and a set of Cooper-Hewitt lights. Using Colitho pre-sensitized plates, Carter made a few offset plates for use on the Multilith in the Duplicating Department. These first offset plates, exposed while they lay flat on the floor, were the better mousetrap that management needed. Within three months, a nuArc FT26 carbon arc vacuum printer was installed and reproduction came to the Illustration Section. This was in November, 1958.

Service staff

Before this, the section had been almost exclusively photographic (some hand-art accounts for the "almost"). One of the first, if not the first, medical research photo sections, the department at The Rockefeller Institute has been in continuous existence for 54 years. In addition to Carter, the staff of Illustration Service includes: Henrik Boudakian, Chief Photographer, in charge of the photo lab; Joe Crenshaw, assistant photographer; Da-

vid H. Ronsheim and Kenneth Lonky, darkroom technicians; Ruth Mandlebaum, Murial Fabrizio and Josephine Vogel, artists; and Florence McAdam, secretary.

Until Carter thought of the mousetrap, photo offset plates had been made by outside firms. While the plates themselves were not expensive, Carter felt that if they could be made inside the Institute, there could be considerable saving in time, and delivery expenses with more convenience.

A Robertson copy camera, which, until the advent of in-plant offset, was used only for copying is now used to make line negs, on Kodalith and Litho T film, for offset work. Photo copying is still done; the volume of photographic work has not dropped as a result of doing reproduction work. The amount of photography has increased, so that the section is now busier than ever. Carter feels, however, that it is better for all concerned to be busy than for the section to stagnate and eventually be reduced in strength because of decreased demand or output.

Once the negative has been made on the Robertson, it is developed according to manufacturer's instructions for that type of emulsion. The dried negatives are then laid out for printing on the offset plate.

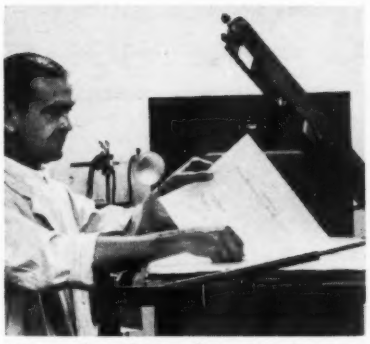
Plate layout

Ruth Mandlebaum, one of three artists in the section, or the customer, plans the actual layout of the offset plate, marks the copy for reduction or enlargement, and strips the negative or negatives in a goldenrod paper "flat."

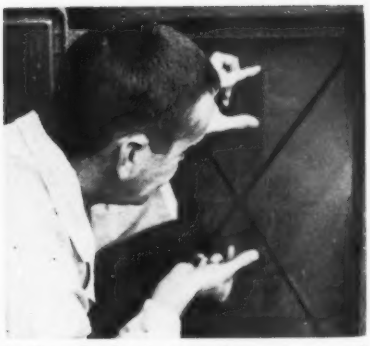
Last year, the illustration Section turned out 470 offset plates on this printer, compared to 142 in 1958. This method is used for short-run work, 50 to 5000 copies. Since runs this size compose the bulk of work at the Institute, 3M Type L plates are used for practically all work.

When the plates are developed, according to specific manufacturer's instructions for each plate, they are sent to the duplicating service where the copy is run off on a 1250 Multilith Press. Offset plates are only a small part of the reproduction section workload. About 90 per cent of the work is on Colitho plates which are made in the section on IBM Varityper. This section, under the supervision of Mrs. Georgia T. Fisher, has a crew of

(*continued on page* 82)



Ken Lonky places document in copy board of Robertson. Artist scales copy.

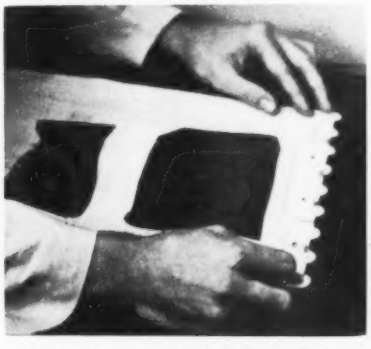


Lonky checks image size on ground glass. Camera was for photo copies.

Ruth Mandlebaum shows layout to Boudakian *(left)* and Carter.

Boudakian cuts goldenrod mask in stripping up negatives for plate.

Final stripping job consists of opaquing dust marks and pinholes on flat.



Offset plate is printed from flat on nuArc printer. Tests set exposure.

Last step is printing, distribution. Here Joseph Blanco runs Multilith press.

Joe Crenshaw operates Ozalid which handles engineering drawings.

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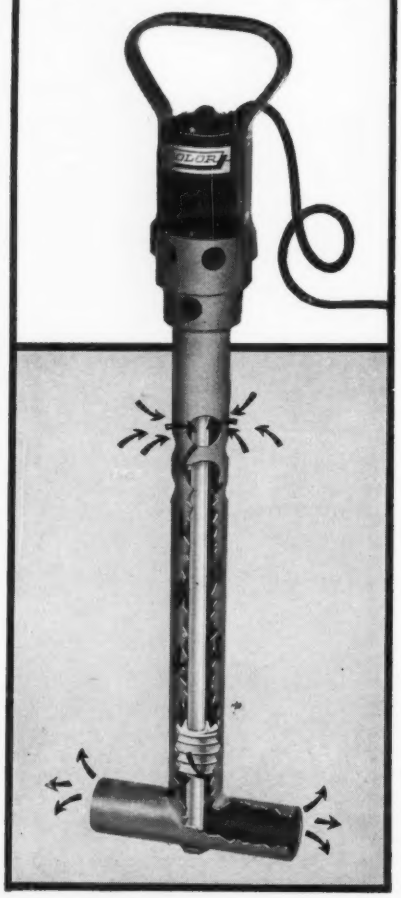

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PMI IN-PLANT REPRODUCTION

Herbert P. Paschel

GRAPHIC ARTS

Stabilizing stabilizers, a color scanner, other reproduction news

Don't take anything for granted when you install new equipment. It's wise to make a performance test first. Otherwise you can run into some pretty expensive production problems. Take the recent experience of a color printer who installed a constant-voltage transformer in the line supplying power to color separation equipment. Previously, line fluctuation had made it impossible to get balanced separation negatives consistently. However, following installation of the stabilizing transformer, the results were even more erratic. Before the source of the trouble was finally located considerable time and effort had been wasted and production was three days behind schedule. What made the trouble so elusive was that the transformer did stabilize the output voltage despite serious line variation. But as the load increased the output voltage decreased. Thus, when two exposing units were operated simultaneously, the light intensity and color temperature of both units was different than when either unit was operated alone. Obviously, the single, multiple or overlapping operation of the equipment on the line created a wide variety of exposure conditions.

Sleeper

In the line were several light sources, apparently of low wattage. The stabilizing transformer had been selected with a capacity about 40 per cent greater than the assumed total wattage of all loads. This was considered to be an adequate margin of safety, but one factor was overlooked—the operating characteristics of electrical devices.

If all the light sources on the controlled line had been of the straight resistance type (tungsten bulbs), there would have been no problem. One of the light sources in the line, however, was a gas-discharge lamp operated from a transformer and ballast circuit. This particular piece of equipment has a high impedance which caused a drop in the line voltage whenever it was put in operation. The problem was solved by operating the discharge lamp from its own stabilized line.

This experience points out that components of an electric or electronic circuit must be compatible. Even wave-form must sometimes be considered (e.g. with densitometers).

Scan-A-Color

Following extensive experimentation, a commercial model of the Fairchild Scan-A-Color electronic color separation scanner has been put into production. By the end of 1960, five or more such machines were tested in the field.

The Scan-A-Color machine is a rotary scanner that produces same-size, continuous tone, color-corrected separations on film. Although designed principally to scan color transparencies, a dual illuminating system permits scanning some opaque originals. Reflection copy that does not exceed 8 x 10 in. in size and is flexible enough to be wrapped around the scanning drum can be separated.

The electronic circuit can be preset to produce either negatives or positives from positive color transparencies or flat copy.

One-mil line

Standard scanning rates are 340, 500, and 1000 lines per inch. Optional at time of installation is either a 250 or 1250-line advance. Each machine thus has four basic scanning rates. This makes it possible to select the scan rate according to the requirements of the subject. The production time for scanning a full 8 x 10 image is 24 min. for the 250-line advance and 120 min. if the 1250-line rate is used. The 340, 500 and 1000-line scans require 32, 48, and 96 min. respectively. Once the machine is loaded and set in operation it is completely automatic and the operator can use the time to process the films previously exposed.

Built-in controls permit considerable versatility in respect to color correction, highlight and shadow detail accentuation, tone adjustment, undercolor removal and black printer construction. Under certain conditions, by means of contact screens, direct halftone separations can be produced with the unit.

The machine can be set to produce separations for three- and four-color, wet or dry printing, with specific tone characteristics required by the printing process employed.

Company plans are to offer the Scan-A-Color on a rental basis.

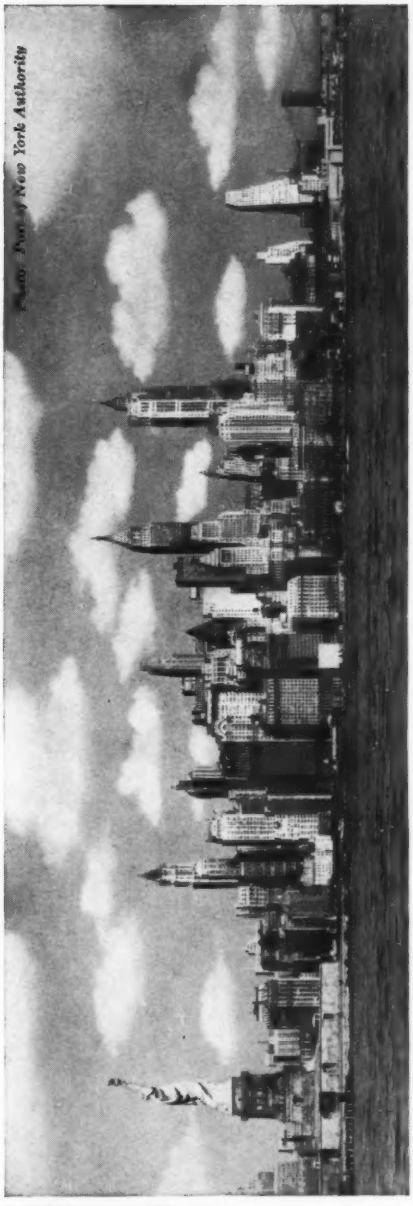
Wash-n-wear

To overcome the loss of print legibility of engineering drawings through smudging of the original, Keuffel & Esser have introduced a washable drafting film. Herculene Drafting Film is claimed to be completely waterproof and extremely resistant to the effects of age, heat and UV exposure. Coupled with a new, equally waterproof drawing pencil tracings can now be restored to original legibility by the simple expedient of washing the tracings with soap and water. A unique pencil, called Duralar, made of a plastic material rather than graphite, provides lines of high density that bond firmly to the base film and are likewise impervious to water.

Herculene-Duralar tracings can be washed over and over again without loss of line density or sharpness. The need for re-drawing caused by attrition (as with conventional tracings) is thus minimized, if not eliminated.

Roll-film dispenser

Despite a definite price advantage, inconvenience in handling has long been a serious obstacle to the popularity of line and halftone films in roll form. For those who use, or would like to use roll-film, the new Unitronics Automatic Roll-film Dispenser may be of interest since it will certainly lessen the time to handle and cut roll-film. This machine stores two rolls of film of any width from 6 to 30 in. It measures and dispenses any length of film from 1 to 36 in. Greater lengths may be obtained by repeating the feed cycle before cutting. Operation is extremely simple. Set the dial for the length of film wanted, position the roll selector for the roll to be cut and pull the knife lever down. Film will feed out automatically to the pre-selected size. On the return stroke of the lever the film is cut off and the dispensing slot sealed. The unit automatically re-sets itself, cutting any number of pieces of identical length.—THE END



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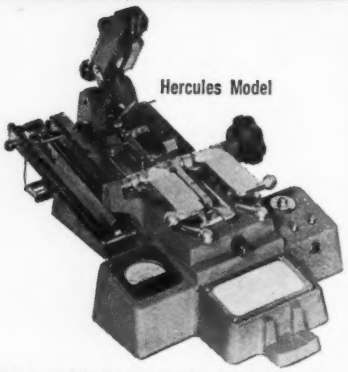

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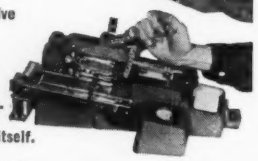
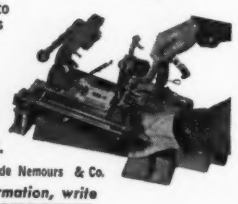


Use the trimmer to remove the surplus tape. The entire procedure is so simple, so positive, that no special training is needed for your existing personnel.



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PMI IN-PLANT REPRODUCTION

Vernon Tate

MICROREPRODUCTION

Techniques of newspaper microfilm prepared for many advances

It may not be generally realized but the background for microreproduction of moderately large originals, as for example engineering drawings, was worked out on the basis of experience gained in microfilming daily and weekly newspapers.

The newspaper as the "diary of the people" with its content of news, personalities, commentary, advertising, financial and other detail constitutes one of the most important of informational sources about a great variety of activities. Large metropolitan dailies and weekly small town or country newspapers record and frequently embellish events that would otherwise be preserved only by memory. The fact that misinformation is almost as frequently purveyed as its more desirable counterpart is perhaps beside the point. Newspapers are so commonplace and so universal that they are taken for granted until a sudden emergency makes them unavailable or until a need arises for an issue a day, a week, a month or more old. All publishers maintain reference copies of their publications and most libraries try to keep local back issues as well; great research libraries maintain far more extensive files.

Yellowing journalism

The principal difficulty lies in the fact that newspapers by their nature must be printed on the cheapest possible paper, and woodpulp newsprint is impermanent. Depending on the method of storage and the amount of use, newsprint will yellow, become brittle and disintegrate in a surprisingly short period of time. Bound newspapers are large, heavy and difficult to use; they are expensive and even more difficult to house and store. Before microfilm, binding was the rule for those who could afford it, otherwise the papers were tied up in bundles. Fragile rare items were sometimes "silked," that is covered with Japanese tissue applied with a special paste, or otherwise treated for preservation. Lamination between thin sheets of acetate using heat and pressure proved too expensive,. More recent chemical methods of restoration have been developed but they, too, are not economically feasible on the scale required. Experiments were made involving offset reproduction on rag paper at ½-size (or ¼ the area) to produce a "permanent" edition but they too proved too expensive.

Up to The Times

When in the late 1920's the thought of trying microfilm gained acceptance, it was decided that a major trial would be made with the World War I years of *The New York Times*. Libraries and collections throughout the country were ransacked to provide a single complete file to be reproduced. It was not easy to bring all the required issues together; now, some 30 years later, it would be impossible. Even the collation of the file was no mean task. There were, moreover, certain important technical problems to be resolved. The work was undertaken in the period 1930-1935 and with its completion the groundwork for many diverse activities in other fields was soundly established.

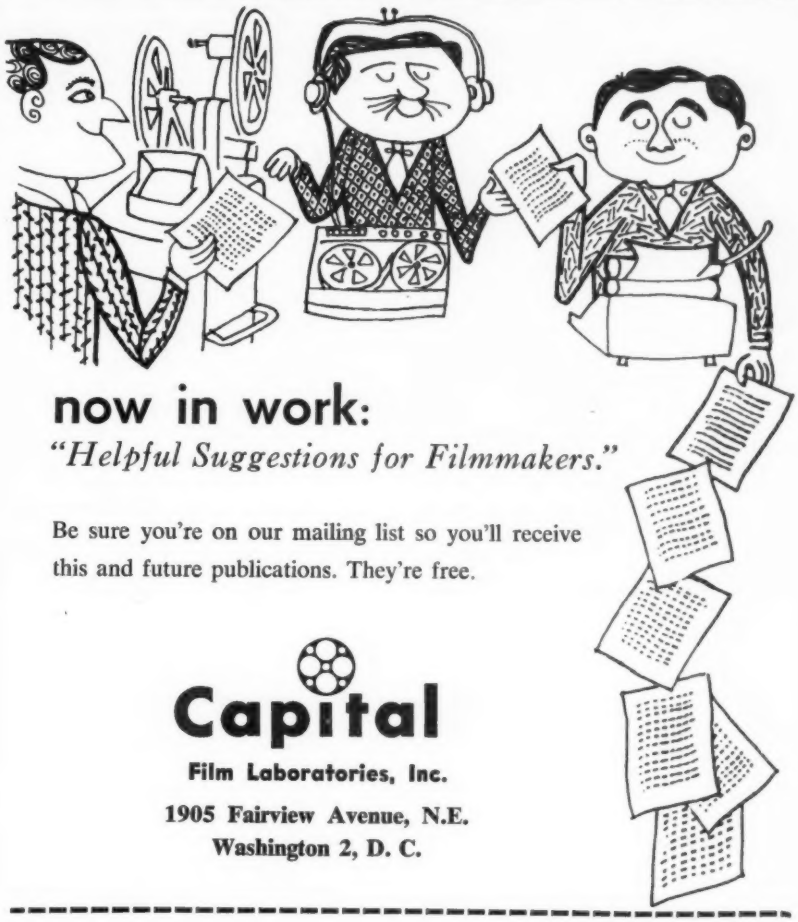
Technically the film itself was of primary concern. Was the base adequate for permanent preservation? Standards were developed for permanent archival film base. Then the emulsion was considered in terms of its composition and processing to remove potentially deleterious residuals. Again a standard resulted for washing and testing completed films intended for permanent preservation. Special emulsions for microfilm reproduction soon made their appearance. Film size became important. All indications pointed to the use of 35mm width but the 35mm motion picture type film was double perforated. In order to produce acceptable motion pictures,

machinery using perforations to produce precise alignment between picture area or frame and perforation was essential. Microfilm has no need for this refinement and the extra width occupied by the perforations in conjunction with a non-standard frame could be used to advantage to lower the working ratio of reduction which in the light of the films then available was judged desirable.

The microfilm camera itself was of primary importance. In order for the project to succeed excellent resolution was required. The measure incidentally was the stock market page where fractional quotations offered serious problems. The classified ads ran a close second. Many cameras were developed but the one which finally gained widest acceptance was the planetary microfile built by the Eastman Kodak Co. and made available through the Recordak Corp. The descendants of these early cameras are still in widespread use. Tests were made with rotary 35mm cameras. A reciprocating copy holder was developed that would allow bound volumes of newspapers to be microfilmed without damage. Librarians, when finally convinced that newspaper microfilming was here to stay, allowed their precious volumes to be taken apart for microfilming.

Processing equipment following the lead of the motion picture industry slowly evolved through the reel or rack and tank methods to the high capacity continuous machines now in professional use. Printers too had to be developed to meet the new requirements. The point of greatest novelty, however, was the perfection of the reading machine. Newspaper microfilm negatives were not made to produce paper prints for use, but the film (a positive) itself was read. Reading machines consequently were a necessity. They had been known and used previously but the newspaper project undoubtedly supplied the needed impetus for their development and eventual perfection.

Technically therefore the full cycle of development has been completed, from the raw stock through exposure, processing, printing and use. On the basis of these achievements much later work would follow. Nowadays the microfilming of newspapers is well nigh universal and well over 500 newspapers are available, some of them only available, on microfilm. They comprise current issues as well as back files. The *Union Catalogue* of the Library of Congress publishes a listing of these microfilms.—THE END



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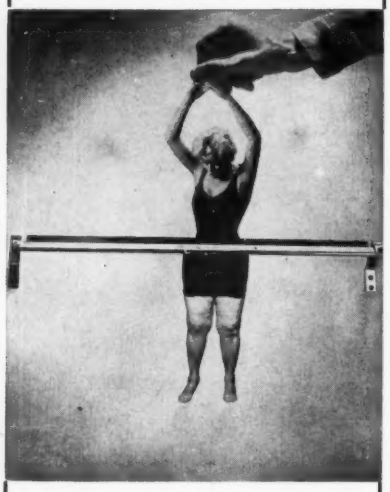

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ONCE OVER LIGHTLY

(*continued from page* 41)

films were not very good, compared with present standards, this remained an academic question.

About 1954, however, Leitz introduced Adox film, a German line now handled by FR. These films had very thin emulsions, fine grain, high acutance and respectable exposure indexes. To get the best performance, the developer had to be a non-solvent type of compensating developer. The recommended ones were two German developers, Neofin, a comparative newcomer, and Rodinal, an Agfa product made since 1891 and in concentrated form, the photographic equivalent of torpedo juice. This powerful stuff, when diluted 50, 75 or 100 to one, produced superbly sharp negatives. Since the film was inherently fine-grain, this was not a requirement for the developer.

Shortly thereafter, X-22 was introduced by FR as the first "one-shot" developer. (For those readers who have wondered about the use of this term so late in the article, "one-shot" is an FR trademark.) Three 1-oz. bottles, each capable of developing up to two rolls at a time, were made available. The first bottles, incidentally, were silver foil packets. Also about this time, Eastman re-introduced Panatomic-X in a newer, improved fine-grain emulsion. By 1956, thin-emulsion films and single-use developers were a household pair.

Basically, single-use dilute developers offer the photographer two qualities; improved sharpness and a flatter curve (reduced contrast) from the compensating action. The cost may be higher fog and increased graininess, especially with the higher-speed emulsions. The theory is that improved sharpness is attained by the developer working mainly on the surface of the emulsion, whereas the action of regular developers tends to be more diffuse extending their action right down to the sub-layer. The final effect is less image spread with the dilute single use developers. This is why some manufacturers suggest a dilute form of their regular developers for maximum sharpness. The dilution transforms it into a surface developer.

Dilute developers have a compensating effect as well, tending to flatten out the characteristic curve. This results in slightly lower, easier-to-manage highlight densities. The reason is that for a given time of

(*continued on page* 79)

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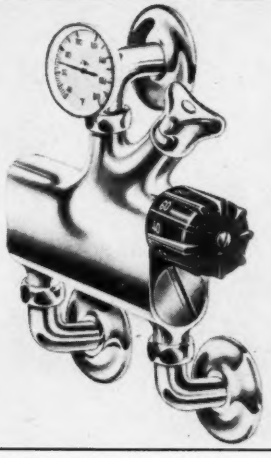

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HYZER ON HIGH SPEED

There's plenty of literature on high-speed photography—and here's Hyzer's plan of attack for it

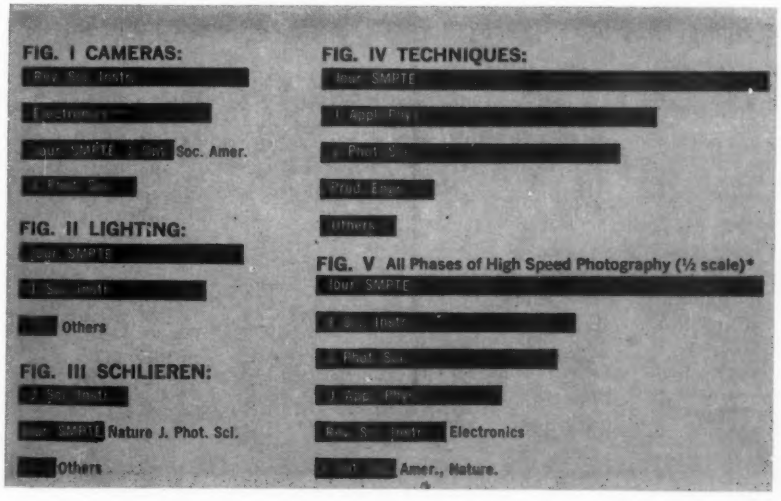
After a discussion or lecture on high-speed photography, one of the most frequent questions asked of the author is: "Where can I obtain more information on high-speed photography as it applies to my specific field?" In answer to this question, which I am sure is one of wide general interest, literature on high-speed photography is numerous, but unfortunately like other fields of scientific endeavor, it is spread throughout many journals, pamphlets, periodicals and books. This makes locating specific information on a particular subject a time-consuming job at best. In searching for this information, however, we are fortunate to have a convenient starting point in the form of a bibliography compiled by Elsie L. Garvin, recently retired Librarian in the Research Library of the Eastman Kodak Co. This bibliography was originally compiled by Miss Garvin in 1953 and classified by John H. Waddell, then Chairman of the High-Speed Photography Committee of the Society of Motion Picture and Television Engineers. The original publication was prepared in two installments which appeared in the journal of SMPTE. The above material, together with supplementary references through 1955, was published in pamphlet form for distribution at the Third International Congress on High-Speed Photography held in London in 1956. Again this year, at the Fifth International Congress on High-Speed Photography held on October 16-22 in Washington, D. C., a new edition has been prepared including references up to the early months of 1960. Literature is classified under several headings including: 1) general, 2) cameras, 3) lighting, 4) oscillograph photography, 5) schlieren photography, 6) technical and techniques, and 7) x-ray. In fact, this excellent 48-page booklet is jampacked with sources of library-literature on almost every aspect of high-speed photography and its application in science and technology.

It is interesting to examine and classify the many references contained in this pamphlet to determine the technical journals of greatest interest to photo-instrumentation workers. Clearly, magazines such as *PMI* are loaded each month with articles and assorted information on nearly all phases of high-speed photographic work. Aside from this, what other technical journals, periodicals and books should the photo-instrumentation engineer refer to on a routine basis, to keep abreast of this rapidly expanding field? Under the category "general information," perhaps the several excellent books on the subject provide the reader with the most and best information. Books are listed in Table I. The broad subject of high-speed photography is covered by Jones, Chesterman and the Waddells. The other references are either more specific or less thorough in their coverage. Several of the references including Tupholme, Henney & Dudley, Wiltshire & Arnold, etc., contain only a chapter on the subject. Collins and the six volumes published by SMPTE are a compilation of papers presented at the Third International Congress on High-Speed Photography and sessions of the SMPTE.

Technical journals are classified according to frequency of articles on high-speed photography in Figures I through V. These graphs are based on the average number of articles on high-speed photography appearing in these various journals in the period 1955 to 1960.

It is important to keep in mind that the technical journals included in these graphs are ranked according to *quantity*, not *quality*. This, perhaps, takes unfair advantage of some excellent journals that may rank low on the charts. Degree of quality depends upon personal preference, and is an attribute each individual must classify for himself, depending upon personal interests and end requirements. With this idea clear in mind, however, the charts are useful in appraising our technical reading habits. For example, if we are interested in high-speed camera design, *Review of*

(*continued on page* 71)



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Ernest E. Reshovsky

PHOTO INSTRUMENTATION

X-rays at a hundred-millionth of a sec. record through 1½-in. metal

A paper delivered at the 5th International Congress on High Speed Photography this fall in Washington, D.C., delved into the use of flash x-ray photography for "hypervelocity" research. The authors—F. J. Grundhauser, W. P. Dyke and S. D. Bennett of the Field Emission Corp., McMinnville, Ore.—operationally define hypervelocities as those involving speed of 50,000 ft. per sec. or about 3,400 mph.

Why radiography instead of photography in such instances? The authors explain that in ordnance research a number of occurrences during detonation, fragmentation and acceleration simply are not recordable through photography. Either the object is opaque to light, or it is itself an intense source of light.

On the other hand, x-rays penetrate where light cannot, and reveal changes in shape and density which can be most meaningful to researchers. With these speeds, exposures must be short. In fact the authors state that they must be in the order of a hundred-millionth of a second to reduce blur in a moving subject to the desired extent.

Stiff jolt

They must be correspondingly intense, too, in order to achieve proper exposure. At film-to-source distances of a few feet with present films and screens, the electron current in the x-ray tube must be of the order of 10,000 amperes.

For sharp images, the focal spot of the x-radiation should be an infinitely small point, but of course some compromise must be made with reality. The authors say that for adequate resolution this energy must be packed into a beam whose cross section measures a maximum of one square centimeter at the anode. Preferably, the cross section should measure one square mm.

In attempting to meet these goals, Grundhauser, Dyke and Bennett stated as their problem the design of a controlled x-ray source in which the electron current is in phase with voltage with the following five design objectives:

1) Maximize x-ray yield while minimizing stored energy.

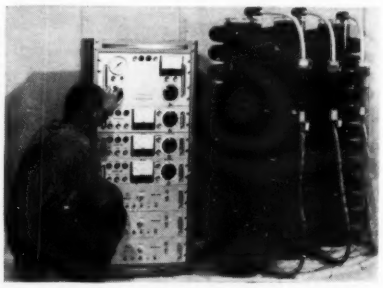
2) Facilitate the measurement of x-ray spectrum to relate observed radiographic densities to the densities of the subject. (Penetration is greater with shorter wave lengths).

3) Maximize sharpness by keeping the source size at a minimum and conserve tubes by reducing anode heating and thermal shock.

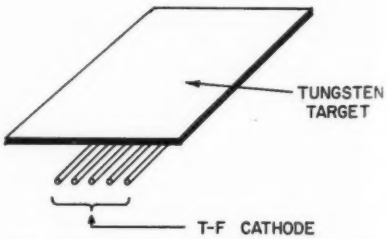
4) Provide reproducible x-ray intensity on a "pulse-to-pulse basis" for needs in sequence radiographs and in quantitative studies.

5) Insure reliability to avoid the expense and delay when data is lost because of tube failure.

They achieved success and lived to tell about it at the High Speed Congress. The new Field Emission Corp.'s x-ray sources achieve expo-



Multiple flash three-channel Fexitron can sequence at 1 microsecond lapses



Schematic shows tungsten wire cathode, plane anode; their distance is 5-10mm

sure times of about .000,000,01 sec. with electron current densities at the anode in the range of 10,000 to 1,000,000 amperes per square centimeter, according to the authors.

They go on to explain that—because the properties of an electron beam are closely related to the characteristics of the electron source—as the electric field at the cathode surface is raised, the emitted electron current density increases rapidly. The size, heat energy and cost of the cathode structure decrease correspondingly. With a tungsten cathode, a field of a few million volts per square centimeter and a temperature of 2700 to 3000°K—the yield in current densities is about 1000 amperes per square centimeter. This case is called T-F emission because current density depends both on temperature (T) and electric field (F) at the cathode.

One of their T-F emission x-ray tubes, the Fexitron, operates under these conditions with an applied voltage of 300,000. The cathode "embodiment" is a group of tungsten wires .01 to .015 in. in diameter with a total length of a few centimeters. The emitting cathode area of this planor electrode tube is one square centimeter. Electron current density at the anode is 2000 amperes per square centimeter. At 300,000 volts the peak power is 600 megawatts.

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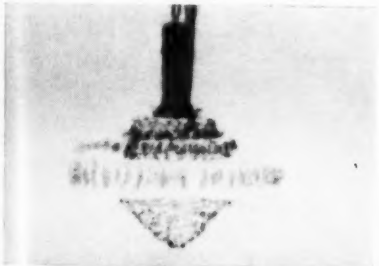
(*continued on page* 71)

Colt .45 is field-stripped in 2/10,000,000 sec. at two-and-a-half paces by Fexitron



Chandelier is the blast pattern of commercial detonation cap 1½ in. from film

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HYZER ON HIGH SPEED

(*continued from page 67*)

Scientific Instruments ranks first in this category with an average of 1.2 articles per year on the subject. If our interest is strictly technique, three journals (*Journal* SMPTE, *Journal Applied Physics* and *Journal Photographic Science*) may be worth subscribing to, in addition to the more practically-oriented magazines.

Figure 5 is a cumulative chart covering references to any or all phases of high-speed photography. For those interested in high-speed photography in general, the journals appearing at the top of this chart should be scanned periodically.—THE END

Flash! Seeing the Unseen by Ultra High-Speed Photography, H. E. Edgerton and J. R. Killian, Jr., Hale, Cushman and Flint, Boston 1939

Action Photography, G. Denes Fountain Press, London, 1940

Photography in Engineering, C. H. Tupholme, Faber and Hyperion Ltd., London, 1945 ("High-Speed Photography," pp. 99-131)

Flash Photography, Gordon Parks, Franklin Watts, New York, 1947

Strobe, the Lively Light, H. Luray, Camera Craft, San Francisco, 1949

The Photographic Study of Rapid Events, W. D. Chesterman, Clarendon Press, Oxford, 1951

High-Speed Photography, its Principles and Applications, G. A. Jones, J. Wiley, N. Y., 1952

Photographic Motion Analysis, J. H. Waddell and J. W. Waddell Industrial Laboratories Publ. Co., Chicago, Ill., 1955

High-Speed Photography, in 6 volumes, New York Society of Motion Picture and Television Eng., N. Y.

Third International Congress on High-Speed Photography, Edited by R. B. Collins, Butterworths Sci. Publ. Ltd., London, 1957

Schlieren Photography, Eastman Kodak Company, 1960

Electronic Flash Photography, R. L. Aspden, Macmillan, New York, 1960

A Study of Splashes, A. M. Worthington, Longmans, New York, 1908

Fast Reactions in Solids, F. P. Bowden and A. D. Yoffe, Butterworths Sci. Publ. Ltd., London, 1958

A Further Handbook of Industrial Radiology, Edited by W. J. Wiltshire, E. Arnold, London, 1957, Chapter 12, "Flash Radiography"

Handbook of Photography, Henney, Dudley, New York, Whittlesey House, London, 1939, Chapter 26

Bibliography on High-Speed Photography, E. L. Garvin, Eastman Kodak Company, 1960.

Available in 1961:
Engineering and Scientific High-Speed Photography, W. G. Hyzer, Macmillan, New York, 1961

Instrumentation and High-Speed Photography, Vol. I Series 2, SMPTE, 1960

PHOTO INSTRUMENTATION

(*continued from page 69*)

rent density and to prevent voltage breakdown in the small structure of the tube. The tube anode, which consists of a tungsten cone, changes from room temperature to 3000°K in .05 microseconds. The penetration at .05 microseconds of exposure is 1¼ in. of aluminum at 6 ft.

The x-ray system used with the foregoing tube consists of a pulser, a 30 kv DC supply, a source of dry nitrogen at variable pressure, a filament step timer and a trigger amplifier housed in a console.

The pulser is a 24-stage Marx-Surge circuit using spark gaps and plug-in storage units.

The trigger amplifier accepts a signal in the range of 10 to 100 volts and amplifies it to a level sufficient to break down the first spark gap in the pulser.

At present, multiple radiographs of the same hypervelocity event require multiple pulsers and tubes. A three-channel system has been operated successfully to obtain three radiographs at intervals of one microsecond (on one piece of film).

Stereoscopic radiographs can be obtained by the use of two channels, and when x-ray penetration or dose rate is critical, a higher voltage can be used. With the same general techniques, a 600 kv 200 amp. system penetrates 6 in. of aluminum at 0.2 microseconds.—THE END

FREE LITERATURE

For your copy of any free literature, circle the appropriate number on the readers' service card, attached, page 75.

AUDIO-VISUAL

CLOSED CIRCUIT TV 203
Nord Photocopy and Electronics. 4-page brochure describes in detail the Scan-A-Graph self-contained closed circuit TV transmitter operated without camera or light.

INTEGRATED ANIMATION 204
Animation Equipment Corp. 8-page booklet describes design features of integrated animation units and explains how such mechanisms provide maximum accuracy, versatility and speed in film production.

MODERN LANGUAGE LAB 205
Cousino Electronics Corp. Illustrated catalog sheet describes the Consolette 10, complete and portable modern language laboratory. Includes list of accessories and prices.

MAGNETIC VISUAL CONTROL 206
Maggie Magnetic Visual Aids Corp. Illustrated catalog sheet describes the Maggie Magnetic Visual Control Systems. Includes list of accessories, prices and instructions on how to set up control board.

FILMSTRIP VIEWER 201
DuKane Corp. Specification sheet describes the Model 576-48 film-strip viewer. Includes prices.

SOUND EFFECTS 202
Thomas J. Valentino, Inc. 30-page catalog lists and describes sound effects records carried by this company. Prices.

CAMERA & LENS

SINAR VIEWCAMERA 207
Karl Heitz, Inc. 24-page booklet illustrates applications of the Sinar Interchangeable Viewcamera for commercial, scientific, industrial, etc., photography.

CLOSE-UP PHOTOGRAPHY 208
Spiratone, Inc. 30-page compilation of close-up facts and close-up accessories for every photographic need.

OPTICAL ILLUSION 209
Ednalite Optical Co. Two-piece optical illusion has chart printed on back which tells what special qualities a filter should have and how to compensate at f-stops from f/2.0 to f/22 for filter factors from 1.5X to 10X.

EQUIPMENT

LIGHTING 210
Speedlight Center. Two price schedules for lights and accessories including AC box, rejuvenator and step down rings. Includes battery pack information.

INFRARED REFERENCES 211
Barnes Engineering Co. 8-page illustrated bulletin, *Infrared Radiation Reference Sources*, gives detailed information on radiation reference sources and Optitherm instruments.

SPOTS 212
Naren Industries, Inc. 4-page leaflet describes the Hy-Lite and Rainbo multi-purpose spots. Includes specifications and accessories.

TRIPOD SCREENS 213
Radiant Mfg. Corp. 4-page, three-hole punched leaflet describes the Radiant line of tripod screens.

CONTINUOUS PROCESSING 214
Fulton Productions. 4-page brochure describes a portable processing machine for continuous processing of 16, 35 and 70mm motion picture and microfilm.

ULTRA-RAPID FLASHER 215
J. A. Maurer. 20-page illustrated brochure describes the Strobokin Ultra-Rapid Flasher. Includes complete description of all component parts.

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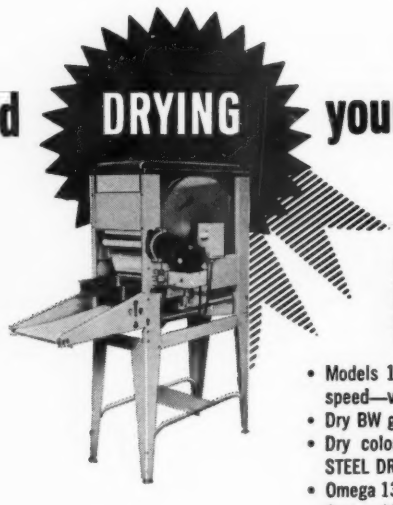

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Bald Eagle Corp. Illustrated catalog sheet describes the double-acting tray rocker for automatic agitation manufactured by this firm. Includes specifications and prices.

PROCESSING EQUIPMENT 217
Pako Corp. 18-page illustrated catalog lists the complete line of photographic processing equipment manufactured by Pako. Includes information on the Pako planning service.

FLOODFLASH 218
Sylvania Lighting Products. Three-hole punched specification sheet describes the FF-33 long duration flash lamp for use in high-speed motion picture studies. Includes guide numbers and technical information.

CUT FILM HOLDER 219
Lisco Products Co. 6-page leaflet describes the Lisco Regal 4 x 5 and 5 x 7 cut film holders.

AUTOMATIC PROCESSING 220
Murmatics, Inc. Illustrated folder gives details on the Murmatic automatic processor for color film and paper. Lists prices and accessories.

GRAPHIC ARTS

GRAPH SHEET CATALOG 221
Keuffel & Esser Co. 92-page catalog lists graph sheets and their special uses. Illustrated with graph sheet reproductions. Includes introductory guide to the selection of grid patterns.

DARKROOM SAFELIGHTS 222
Miller-Trojan Co., Inc. Illustrated catalog sheet describes the darkroom safelights manufactured by this company. Includes complete specifications.

DUAL-PURPOSE TABLE 223
nuArc Co., Inc. Catalog sheet describes the new register and repeat line-up table. Includes accessories and prices.

FAREWELL TO ARCS 224
Natural Lighting Corp. 2-page illustrated reprint from *The International Blue Printer*, "A Farewell to Arcs" describes one company's experiences using ColorTran illumination.

SHARPSHOOTER 1418 225
Miller-Trojan, Inc. Illustrated specification sheet describes the Sharpshooter 1418 camera. Lists standard and optional equipment and prices.

MOTION PICTURES

EDITING TABLES 227
Florman & Babb, Inc. Three-hole punched catalog sheet describes the Acmade Mark II editing tables. Includes prices.

PHOTOGRAPHY AND RADAR 228
Flight Research, Inc. 4-page illustrated bulletin, *Recorder*, features in this issue an article on photography and radar.

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HYPERVELOCITY RESEARCH 229
Field Emission Corp. 16-page reprint, *A 50-millimicrosecond Flash X-ray Photography System for Hypervelocity Research,* of paper presented at 5th International Congress on High Speed Photography.

FILM/DATA EQUIPMENT
Richardson Camera Co. 38-page illustrated catalog gives complete specifications for scientific film/data equipment manufactured by this company. Request on company letterhead from: Richardson Camera Co., 2526 N. Ontario St., Burbank, Calif.

AURICON SOUND CAMERA 230
Bach Auricon, Inc. 6-page illustrated brochure describes the Auricon Pro-600 Special 16mm double-system or single-system sound camera. Includes list of accessories and prices.

REMO-CAM 231
PhotoLab Equipment and Repair Co. Illustrated catalog sheet describes the Remo-Cam, a fully automatic, electrically operated 35mm camera. Includes specifications and prices.

TRIPOD SUPPORTS 232
The Camera Mart, Inc. Illustrated catalog sheet describes Camart's heavy-duty triangle and car-top clamps for tripods.

STOP-MOTION PROJECTOR 233
Camera Equipment Co., Inc. Specifications sheet describes the CECO 35mm Red Lake stop-motion projector. Gives price and specifications.

OPTRON TRACKER 234
Optron Corp. 12-page illustrated brochure describes in detail the Optron Model 650 Tracker for the remote measurement of motion, vibration and displacement.

PROFESSIONAL 8MM 235
Frederick F. Watson, Inc. 4-page newsletter, *Cine Magnetic News,* features an article on the use of 8mm by professionals.

SERVICES

COLOR PRINTS 236
Ralph Marks Color Labs. 12-page booklet, illustrated in color, describes services available from this New York firm. Includes prices.

B&W OR COLOR SERVICES
Meteor Photographic. 8-page catalog of laboratory services and prices lists line of custom and quantity printing. Request on company letterhead from: Meteor Photographic, 4630 Oakman Blvd., Detroit.

FULL COLOR PRINTING 237
Richard Coletti Assoc. Price list for full color printing for catalog sheets, inserts, sales aids, postcards, etc.

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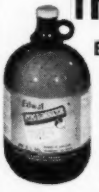

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NEW PRODUCTS

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MINIATURIZED FLASH 111
A miniaturized model of the self-contained Futuramic electronic photo-flash unit has been developed by the Heiland Div. of Minneapolis-Honeywell. The Futuramic II is 9½ in. high and weighs 24 oz. It delivers a Kodachrome guide number of 35, has a flash duration of 1/1500 sec. and a color temperature rating of approximately 5400K. Price: $59.95.

DAGE CAMERA 104
A 15 lb., 5 x 5 x 20-in., completely transistorized TV camera for industrial use at low light levels has been announced by Dage Television Div., Thompson Ramo Wooldridge, Inc. Called the Dage Model 81 Industrial 10 Camera, the company claims it can solve, through the use of an image orthicon camera tube, the problem of television monitoring at light levels which render Vidicon cameras useless.

ZOOM LENS 105
A 17.5mm to 85mm, f/2, Pan Cinor, Model 85 lens for Arriflex-16 has been announced by the Arriflex Corp. of America. The f/12, 5X focal range, lens focuses down to 6 ft. Zoom movement is lever operated. Price: $399.

DOT & FIBRE CHECKER 101
A new magnifier for the graphic arts is the 10X Logan Dot & Fibre Checker produced by S. B. Logan & Co. The unit consists of a double lens of ground and polished optical glass in a compact aluminum housing and a detachable base covered with Vinyl plastic. Price complete with base: $4.

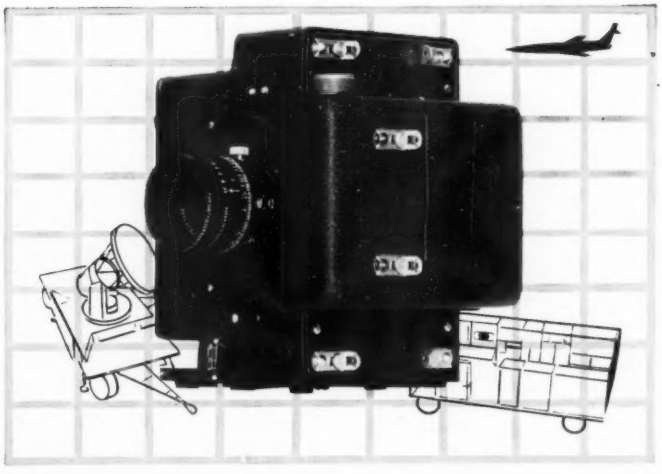
3000 SPEED POLAROID 4 X 5
Polaroid Corp. has announced the first new emulsion in its 4 x 5 film since the introduction of the product line in 1958. Called Type 57, the material has a speed equivalent to ASA 3000 and can be processed in 10 sec. The new sheet material is intended for use in the Polaroid Land Film Holder No. 500, which is designed for all cameras and backs using 4 x 5 film holders. The 10 sec. processing time in most instances delivers a print with contrast suitable for scenes in bright sunlight. For less contrasty subject material, a longer processing time up to about 30 sec. is advisable. The price of Type 57 is unchanged from previous films.

VOUGHT CAMERA 103
A camera which is providing aeronautical engineers with filmed-in-flight records of stress changes and other wing surface movements encountered by the X-15 during its record-breaking flights at altitudes above 136,000 ft. and at speeds exceeding 2100 mph, has been developed by the Vought Camera Co. Equipped with a specially designed pulse-cine mechanism, it records the stress changes on 16mm film, with the pulse-cine device making it possible to take a pre-determined number of fps to record the smallest changes in wing surface stress.

TELEPHOTO UNIT 108
The 7-in., 16-oz. TeleVar telephoto unit for single-lens reflex cameras, with a range of 350mm to 650mm, has been introduced by D. P. Bushnell & Co., Inc. Focusing distances vary from 14 ft. to infinity at the 350mm position, and 12 ft. to infinity at the 650mm position, with values from f/8 to f/16. On cameras with non-removable lenses and leaf type shutters the TeleVar attaches to a series "V" filter ring and converts cameras with normal 50mm lens to 325mm, f/8; 80mm lenses to 500mm, f/11, with minimum focus at 5½ ft. Prices: for cameras with completely interchangeable lenses and focal plane shutters, $59.50; for cameras with non-removable lenses or leaf type shutters, $49.50.

FILM CORE DISPENSER 110
A wall dispenser for film cores has been produced by Camera Mart. It comes in 16, 24, and 36-in. sizes priced from $9.50 to $14.50.

Radar on Target—PROVE IT!



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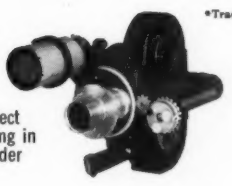

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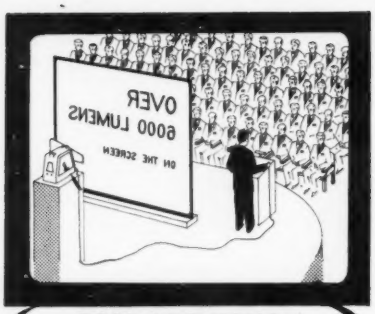

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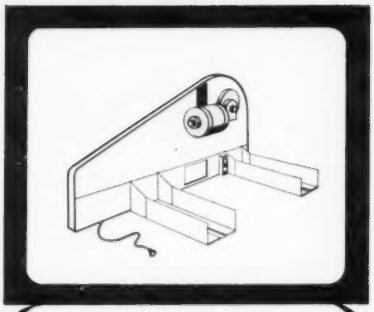

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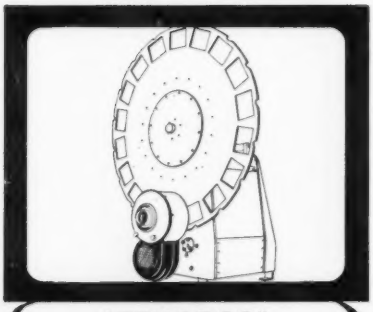

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Get more information. Circle 430, page 75

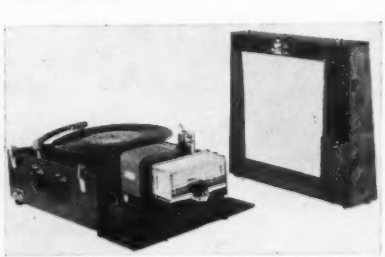
ANGENIEUX VARIFOCAL LENS 106
The Angenieux Varifocal lens, with a focal range from 35mm to 140mm, an f/3.5 maximum aperture, and focusing down to 5 ft. has been produced by the Arriflex Corp. of America. It is designed to cover the 35mm motion picture frame and may be used on either Arri-16s or Arri-35s. Price: $1,395.

BELL & HOWELL TAPE RECORDER 107
A four-track portable stereo tape recorder, Model 785-4TS, has been introduced by Bell & Howell Co. It contains two 5¼-in. speakers; has five-way pushbutton control; a monitor control for listening while recording; two speeds; a recording level guide; 72-in. output-input cord and optional equipment including earphone and remote pause control foot pedal. It has an overall frequency response of ±4 db from 50 to 13,000 cps at 7½ ips and is powered by a five-watt amplifier. Price: $259.95.

FILMLINE PROCESSING EQUIPMENT 115
A new line of automatic machines for the processing 8mm/16mm and 35mm Kodachrome film has been produced by the Filmline Corp. Filmline model 16KC26 is designed to process 8mm/16mm Kodachrome film at a speed of 26 ft. per min. Price of the basic machine is $34,850. Model 35KC13 is designed to process 35mm Kodachrome width at a speed of 13 ft. per min. Price: $35,925. The 16KC60 is a 60-ft. per min. 16mm Kodachrome processor priced at $74,725. Model 35KC45 is a combination 16mm and 35mm Kodachrome processor with separate racks and drive systems using common chemistry. Speed on 16mm or 35mm can be run interchangeably, alternately, or at the same time. Price: $11,000.

THE PANCOLOR 50MM F/2.0 116
The Pancolor 50mm f/2.0, a new Zeiss lens for the Exakta, with an instant reopen automatic diaphragm, has been introduced by the Exakta Camera Co. The focusing mount has a dual scale with calibrations in feet and meters with a range from infinity down to 1.7 ft. The lens is priced separately at $140.

SLIDE/FILMSTRIP PROJECTOR 114
Combining both slide and filmstrip projection with sound, the Picturephone 400 has been introduced by McClure Projectors, Inc. It features a 5-in. speaker, three record speeds and a built-in viewing screen. Filmstrip showings are facilitated with an automatic rewind. Seventy-two slides can be stored in its two automatic slide changers. It weighs 18½ lbs. and measures 15 x 6½ x 13 in.



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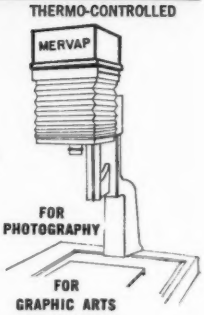

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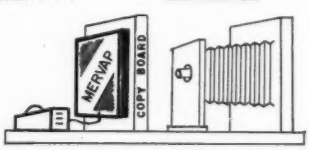

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DIRECT POSITIVE

(*continued from page 35*)

turer's instructions.

12. Wash. One min. in running water at 65-68F.

13. Hypo Eliminator. Per manufacturer's instructions.

14. Wash. As directed after eliminator.

15. Final rinse. Water 65-68F with a few drops of wetting agent for 20 sec.—THE END

CONDENSED PROCESSING TABLE

ELAPSED TIME (minutes)	TIME IN STEP (minutes)	STEP
0-10	10	FIRST DEVELOPMENT
10-15	5	WASH
15-18	3	BLEACH
18-21	3	WASH
21-23	2	CLEARING BATH
23-26	3	WASH
26	20 sec.	WETTING AGENT
26-27	1	RE-EXPOSURE
27-29	2	SECOND DEVELOPMENT
29-30	1	SHORT STOP
30-35	5	FIXING
35-35½	30 sec.	WASH
37-38	1	HYPO CLEARING AGENT
39-44	5	WASH
44	20 sec.	WETTING AGENT

ONCE OVER LIGHTLY

(*continued from page 66*)

development, a dilute developer will be able to develop the less-exposed shadow grains as far as they can be developed. The more exposed highlight grains which require more developing agent to reach a given stage of development are relatively less developed: the dilute developer just can't work on them fast enough in the time allotted. Hence, you get good shadow detail plus highlights which are not blocked. This compensating action is one reason why dilute developers are recommended for thin-emulsion, slow-speed films which have inherently greater contrast than the faster films.

Today, single-use developers fall into two general types: those made for one-time use, such as X-22, Ethol TEC, Edwal FG 7, Rodinal, etc., and those diluted for one time use such as D-76 and Microdol-X. The results with both groups are almost alike. Some developers, like X-22 give better results with slow films. Some, like Rodinal, can be used with films of various speeds with proper dilution, from Isopan FF (1:100) to Isopan Record (1:50).—THE END

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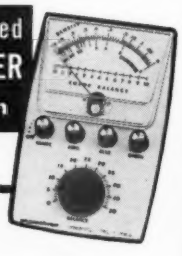

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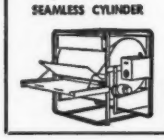

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RESEARCHER'S REPORT

(*continued from page 39*)

from time to time. There are several disadvantages, however which include the possibility of mercury contamination, auxiliary operating devices, ultra-violet radiation which would cause fogging, and an intensity much higher than required for more darkrooms.

Electroluminescent panels

The electroluminescent light panel, although still in its early development stage, promises to come close to attaining the ten characteristics of the ideal darkroom light source described above.

Electroluminescent panels have been designed into a number of complete safelights. The housings are primarily of a thin, flat design and are currently made of an opaque plastic back with a clear plastic cover which completely encloses the light panel and filter. Special sizes and shapes can be made up at moderate cost, even in small quantities.

The electroluminescent panel is an area light source and gives a soft diffused light over the whole area of the panel. For this reason, these units are very good for exit and sign lights when used with a suitable mask. The thin, flat design of the housings, together with the low level light output makes them especially suitable for guide and obstruction marker lights. Their overall uniform brightness and flat design also makes these units suit-

The author of this report on darkroom lighting systems is Herbert S. Glick, Senior Engineer, Engineering Division, Eastman Kodak Co. Mr. Glick studied electrical engineering at Columbia University and is a 1938 graduate of Pratt Institute. He is a registered engineer, a member of A.I.E.E., I.E.S., N.S.P.E. *and the winner of several first prizes in* I.E.S. *lighting competitions and first prize winner of the 1957 International Lighting Competition.*

The report was delivered as a paper at the National Technical Conference of the Illumination Engineering Society, September 11-16, 1960, Pittsburgh, Pa. It is reprinted with the permission of the copyright owner, the Journal of the Illuminating Engineering Society.

able for backlighting of instruments, splice boards, and some types of inspection workplaces.

Conclusion

The illumination of darkrooms poses many problems and severe limitations not normally encountered in the design of the usual lighting systems. Because the factor which determines how much light can be used in a darkroom is the sensitivity of the product rather than the workers' visual needs, it is remarkable that high quality, efficient production can be carried on under lighting conditions which, in the usual sense, may be considered extremely sub-normal. Workers in darkrooms must depend much more on their other senses than workers under normal lighting conditions.

Darkroom lighting, therefore, can be considered not as a complete answer to the workers' visual needs, but rather as a tool in his work.

It is hoped that this paper will help to direct attention to the fact that there is much more room for improvement in present darkroom lighting methods, equipment, sources and techniques.—THE END

REFERENCES

1. Weber, G.: "Some Investigations on the illumination of Photographic Darkrooms and the Determination of the Spectral Sensitivity of Photographic Material."
2. Herbert, Henry E.: "Film Darkroom Lighting," Manuscript Canadian Kodak Ltd., Toronto.
3. "Safelights in the Workshops of the Paper Department," Report No. V 2688, Kodak Pathe Research Laboratories, Vincennes, France, June 2, 1954.
4. Mees, C. E. Kenneth: Photography.
5. Kodak Graphic Arts — Films — Plates (Data Book).
6. Westinghouse Lighting Handbook.
7. "Darkroom Design and Construction," Eastman Kodak Co., Rochester, N. Y.
8. Barrett, Mestor and Wyckoff, Ralph: "How to Build and Equip a Modern Darkroom."
9. Weinberg, V. B.: "Construction and Arrangement of Fixtures for the Illumination of Darkrooms in Motion Picture Film Factories," abridged translation from Kino Photo Chemical industry No. 6, 39-50, 1937. Manuscript.
10. "Kodak Wratten Filters," Eastman Kodak Co., Rochester, N. Y.
11. Kingsley, L. K.: "Safelight Manual for Roll Film Operation."
12. Arens, H. and Eggert, J.: "Darkroom Illumination with Special Attention to the Psychological Sensitivity of the Human Eye."
13. "Safelights for the Darkroom in Theory and Practice," British Journal of Photography, 1911, pp. 474, 494, 533, 628, 777, 872, 951; 1912, p. 22.
14. Lamp Bulletin, General Electric Co., Bulletin LD-1.
15. "Westinghouse Rayescent Lamps—An Electroluminescent Light Source."
16. "Panelescent Lamps," Engineering Bulletins 0-187 and 0-194 Sylvania Electric Products, Inc.

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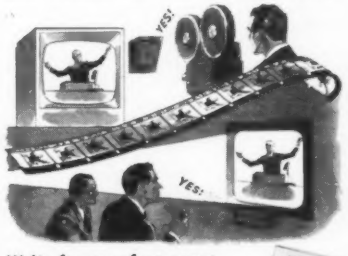

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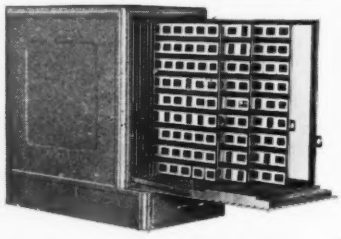

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(*continued from page* 61)

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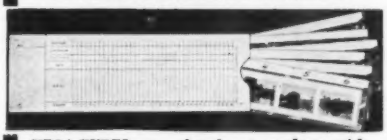

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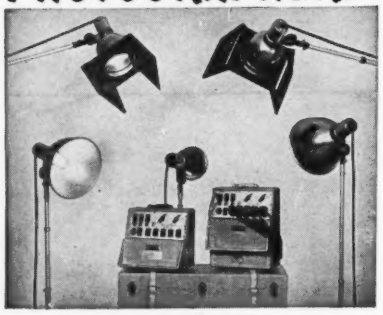

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